November ye 13 = 1738

John Harris Carpenter

in Old Street

8505.c.114

THE

Gauger's Practice:

OR,

A Compendious Way of Gauging Brewers
TUNS; and the Gauging of CASKS,
according to the true Rules of Art.

WITH

A Table of CYLINDERS

In Ale-Gallons, in Centeſimal Parts:

Calculated to every Tenth of an INCH, in
Diameter and Depth.

By *George Ward*, Philomath.

The Third Edition.

Whereunto is Added,

The Elements of Gauging;

OR,

A Solution of all the neceſſary Problems in
Gauging; with the Reaſons of them Geometrically Demonſtrated.

By *JAMES LIGHTBODY*, P.M.

LONDON:
Printed for *Robert Battersby*, at *Staple-Inn-Gate*, next
the Barrs in *Holbourn*, 1704.

To my Brethren

THE

Officers of Exciſe,

In *England* and *Wales*.

Gentlemen,

THeſe Tables of Cylinders *are the chief things in this Tract. I Compoſed them for my own uſe ſome Years ago; and have been by Officers in ſeveral Countreys* (ſince Superviſor) *much Sollicited to put the ſame in Print, for the Good of others: I doubt not its being Serviceable, though I cannot defend it from all Critical Exceptions; yet my Care throughout the whole, makes* *me boldly Warrant it free from any Fundamental Errors.*

I have endeavoured to make every thing in it as plain as Words can expreſs: That it may merit your favourable Receptions, and be really uſeful to you, is the hearty deſire of

Your Affectionate Brother

G. Ward.

29 JA63

DECIMAL Arithmetick.

Notation of *DECIMALS.*

A *Decimal Fraction* is that which by prefixing a Point or Prick towards the left Hand; its Value is decreaſed from ſo many Units, to ſo many tenth parts of an Unit. And if a Point and a Cypher, or Digit be prefixed, it will then be ſo many hundred parts; and if a Point and two Cyphers or Digits be prefixed, its Value is decreaſed to be but ſo many thouſand parts, *&c.*

For as in whole Numbers the *Value* or *Denomination* of places increaſes by Tens from the *Units* place towards the left Hand, ſo in *Decimal Fractions*, the *Value* or *Denomination* of places decreaſe by Tens from the Units place towards the right Hand.

Alſo as Cyphers before a whole Number have no Value, ſo Cyphers after a *Decimal Fraction* are of no Signification.

And as Cyphers before a whole Number do increaſe that Number, ſo Cyphers before a *Decimal Fraction* do diminiſh the Value thereof.

EXAMPLE.

.4	is 4	Tenth	Parts.
.04		Hundred	
.004		Thouſand	
.0004		Ten Thouſand	

Addition and *Subſtraction*.

THe Operation of *Addition* and *Subſtraction* in *Decimals*, are the very ſame as in Vulgar Arithmetick, only obſerve to place *Units* under *Units*, and *Fractions* under *Fractions*, in their own proper Ranks and Files.

EXAMPLE.

To 745.2629
add { 84.201
2.74
9.5
.8 }
Tot. 842.5039

From 584.096
Subſtract 29.92845
Reſts 554.16755

Note, *In Addition there muſt ever be as many places of Fractions in the Total, as are found in any of the Sums to be added together.*

Multiplication.

M*Ultiplication* of *Decimals* is likewiſe the very ſame as in *Vulgar Arithmetick*, only there muſt be ſo many Figures for *Decimals* in the *Product*, as there was *Decimals* in both the *Multiplicand* and *Multiplier*. See the Work,

Multiplicand 87.942
Multiplier 5.428
703536
175884
351768
439710
Product 477.349176

.274
.26
1644
548
Product 7124

	.004	.38	8.6
	.002	.09	.00002
Product	.000008	.0342	.000172

When it happens that there are not ſo many Figures in the *Product* as there are *Decimal Fractions* in the *Multiplicand* and *Multiplier*, then place Cyphers before the *Product*, till the Number of places be equal, as in theſe three laſt Examples.

Diviſion of *Decimals*.

Diviſion of *Decimal Fractions*, or mixt Numbers, is performed after the ſame manner as in whole Numbers.

EXAMPLE.

Let 29 be divided by 641 .42

In this Example the Diviſor (641.42) is greater than (29) the *DIVIDEND*, therefore in this and all the like Caſes, you muſt place a competent Number of Cyphers behind the *DIVIDEND*, which if it be a whole Number, then the Cyphers ſo placed, muſt be *diſtinguiſhed* therefrom as Fractions, as here I put ſix Cyphers behind 29, and place the Number thus.

```
641.42) 29.000000 (.0452
              • • •
        25 6568
        -------
         3 34320
         3 20710
         -------
           136100
           128284
           ------
  The        7816 remain.
```

Then proceed to the Diviſion as if all were whole Numbers, and to know the Value or Denomination of places in the Quot. is the only difficulty: For the reſolving of which there are ſeveral Rules; but the moſt general and infallible Rule is this:

The firſt Figure in the QUOTIENT, muſt be of the ſame Denomination with that Figure in the DIVIDEND, which ſtands *(or is ſuppoſed to ſtand)* **over the Units place in the Diviſor.**

Therefore place your *Dividend* and the *Diviſor* thus, as it ought to ſtand if it were to be ſubſtracted, and you will ſee the Cypher in the *Dividend*, which ſtands over the Units place in the *Diviſor*, is the place of hundredths.

```
29.000000
 6 41.42
```

Therefore according to the *Rule* given, the firſt Figure in the *Quot.* muſt be of the ſame Denomination, *viz.* of hundredths; therefore put a prick and a Cypher before it, and the *Quot.* will be ,0452

In dividing of whole Numbers or mixt, if there happen to be any Remainder, you may bring down more Cyphers; and by continuing your Diviſion, carry the Quote to as many places of Fractions as you pleaſe.

And by theſe following Examples, you will thorowly underſtand *Diviſion* of *Decimals.*

Divide 29 by 6.4142

```
6.4142) 29.000000 (4.52
                •••
        25 6568
        -------
         3 34320
         3 20710
         -------
           136100
           128284
           ------
             7816

    29.000000
     6.4142
```

Here, by the general Rule, the firſt Figure in the Quot. is Units.

Divide 29 by .64142

.64142) 29.000000 (45.2
25 6568
3 34320
3 20710
136100
128284
7816

29.000000 (
.94142

Here the firſt Figure in the Quot. is Tens in whole Numbers, becauſe the ſuppoſed Units place ſtands under the place of Tens in the Dividend.

Divide .000000441 by .000542

.000542) .000000441 (.0008
4336
74

.000000441 (
.000542

Here the firſt Figure in the Quot. is the fourth place of Decimals, becauſe the ſuppoſed Units place ſtands under the fourth place of Decimals in the Dividend, therefore put a Prick and three Cyphers before it, and the Quote will be .0008

Divide 644 by .04

```
.04 ) 644 ( 161
       ..
      4
      —
      24
      24
      —
        4
        4
        —
        0

 644          ( 16100
 .04      The true Quot.
```

Here, by the General Rule, the firſt Figure in the Quot. is Tens of Thouſands, (of whole Numbers) becauſe the ſuppoſed *Units*-place ſtands under the place of Tens of Thouſands in the *Dividend*; ſo after the Diviſion, add two Cyphers to the Quot.

When any Number, either *Decimal* or *Mixt*, is to be divided by an Unit with Cyphers, as 10, 100 or 1000, *&c.* only remove the Prick in the *Dividend* ſo many places towards the left Hand, as there are Cyphers with the Unit.

Thus 875.4 divided by 10 is 87.54, divided by 100, it will be 8.754, by 1000, is .8754, and if by 10000, the Quot. will be .08754.

Note, That the true *Proof* of DIVISION is by MULTIPLICATION, and the true *Proof* of MULTIPLICATION is by DIVISION.

Reduction of *Decimals*.

A Vulgar Fraction is reduced into a Decimal, by poſtponing to the *Numerator* a competent number of Cyphers, and dividing it by the Denominator.

Which Quotient will be a Decimal Fraction, equal in value to the Vulgar Fraction given: So $\frac{3}{4}$ (of any thing) reduced as aforeſaid will be .75

EXAMPLE.

```
4) 3.00 (.75
   28
   ——
    20
    20
    ——
    00
```

Note, *That the odd parts of an Integer cannot be exactly reduced to a* Decimal, *for there will generally be a* Remainder, *in ſuch Caſes carry on the* Decimal *to 5 or 6 places, and it will be very near the truth.*

EXAMPLE.

```
7) 5.00000 (.71428,
    .....
   49
   ---
   10
    7
   ---
    30
    28
   ---
    20
    14
   ---
     60
     56
    ---
      4
```

To give the *Decimal* of Shillings.

Divide the Number given by 20, (the Shillings in a Pound) and the *Quot.* will be the *Decimal* required.

To give the Decimal of Pence, divide the Number given by 240, (the Number of Pence in a Pound,) and the Quot. is the *Decimal.*

To give the Decimal of Farthings, divide the Number given by 960, (the number of Farthings in a Pound,) and the Quot. is the *Decimal.*

How to reduce the *Decimal Fraction* to the known parts of the *Integer*, as the *Decimal* part of a Pound Sterling, *&c.*

EXAMPLE.

.745 the Decimal part of a Pound
20 muſt be multip. by 20 the Shil. in a Pound.

Shil. 14.900
12 Pence in a Shilling.

Pence 10.800
4

Farth. 3.200
.75 A Decimal part of a Foot
12 multiplied by the Num. of Inch. in a Foot

150
75

9.00 brings out Nine Inches.

DEFINITION.

THe *Extracting* of the *Square-Root* of any Number, is the finding out another Number, that being ſquared (or multiplied by it ſelf) the *Product* is equal to the Number firſt *propounded.*

Square Numbers are either *Single* or *Compound*, *Single* are thoſe whoſe *Roots* conſiſt only of one Figure, (as in this Table) *Compound* are all thoſe above 100.

Square Numb.	1	4	9	16	25	36	49	64	81
Sides or *Roots*	1	2	3	4	5	6	7	8	9

The Number *given* to be *extracted*, firſt point the Units place with a Period, and ſo ſucceſſively every ſecond Figure, but in *Decimals* you muſt point from the Units places towards the right hand, and if the places are odd, poſtpone a Cypher to make them even.

The Number of theſe Points ſhews the Root, or how many Figures will be in the Quot. and the Reaſon why every ſecond Figure is pointed, because the Square of the greateſt Number under 10, can conſiſt but of two places.

EXAMPLE.

Extract the Square Root of $\dot{5}2\dot{4}3\dot{4}$

. . .
52434(2
4
—
1

Firſt obſerve what is the greateſt *Root* in the firſt Period towards the left Hand, which you will find here to be 2, (and its Square is 4) place it in the Quot. then the Square of 2 is 4, which ſubſtract from 5 the firſt Period, the remainder is 1, which place underneath. *(This is the firſt Work, and no more to be repeated.)*

. . .
52434(2
4
—
124

Then to this remainder poſtpone the next Period, (which are always 2 Figures)for the *Dividend* and the *Example* will ſtand thus.

. . .
52434(2
4
—
124
4

Then double the Quot. (which here makes 4) for a new *Diviſor*, which muſt be placed ſhort of the place of unity, (as here you ſee.)

. . .
52434(22
4
—
124
42

Then ſay how oft can I have 4 in 12, I can have 3 times, but that will be too much, therefore I can have it but 2 times, which 2 place in the Quot. as here you ſee, and likewiſe place it after the Diviſor 4.

: . :
52434(22
4
—
124
42
84
—
40

Then multiply the ſaid 42 by 2, (the laſt Root) and ſubſtract the Product, as in *Diviſion*; thus 42 multiplied by 2 is 48, which ſubſtracted from 124, the remain is 40.

· · ·
52434(22
4
—
124
42
84
—
4034
44

To which poſtpone the next Period for a new *Dividend*, and double the Quot. for a new *Diviſor*, and work the ſame way as in the laſt Period.

And if a long Sum of a great many *Periods* were to be *extracted*, the ſame Work is to be obſerved till the whole Extraction is finiſhed.

· · ·
52434(228
4
—
124
42
84
—
4034
448
3584
—
450 Remain.

And if at any time there be a Remain after the *Extraction*, then add as many pairs of Cyphers as you pleaſe, and *extract* as before, and as many pairs of Cyphers as you uſe, ſo many places of *Decimals* will be in the *Root*; in this Example there remains 450.

```
 . . .
52434(228.98
4
—
124
 42
 84
————
 4034
  448
 3584
 ————
  45000
   4569
  41121
  —————
   387900
    45788
   366304
   ——————
    21596
```

To which here I have poſtponed two pair of Cyphers, which makes two *Decimals* in the Root, and might have wrought to a great many more Decimals by a continual poſtponing of pairs of Cyphers.

But if the *Diviſor* at any time exceeds the particular *Dividend*, then you muſt place a Cypher in the Quot. and to the *Dividend* poſtpone another

Period (if there be any) or a pair of Cyphers; and if that will not do, then add another Cypher to the *Quot.* and poſtpone another Period or pair of Cyphers, as in this following Example.

Extract the *Square Root* of 3610

```
. .        . .        . .
3610(6     3610(6     3610(60
36         36         36
—          —          —
           10         1000
```

Here the greateſt Root of the firſt Period is 6, which place in the Quot. then the Square of 6 is 36, which Subſtracted from the Period, remains nothing. Then take down the next Period, which is but 10, then double the *Quot.* for a new *Diviſor*, and it will be 12, which is above the *Dividend*; therefore place a Cypher in the *Quot.* and poſtpone a pair of Cyphers to the *Dividend.*

```
. . .
3610(60.0        3610(60.08
36               36
—                —
  100000         100000
  1200           12008
                 96064
                 ———
                 3936
```

Yet the *Diviſor* is too big for the *Dividend*, therefore place another Cypher in the *Quot.* and a pair of Cyphers to the *Dividend*, and double the *Quot.* for a new *Diviſor*.

Note, That ſo many Periods as there are in the *Dividend* of whole Numbers, ſo many places of whole Numbers in the *Quot*. and as many Periods of Decimals in the *Dividend*, ſo many Decimal Figures in the *Quot*.

To prove the *Extraction*, ſquare the Root (or Quot.) to which add the Remain, (if any be) and if it make the ſame of the Dividend, the Extraction is right; otherwiſe not.

THE

THE
Gauger's Practice.

GAUGING.

GAUGING is an Art which cannot be underſtood well without *Decimal Arithmetick* and *Geometry*. Therefore he that would be a compleat *Gauger*, muſt have ſome competent Skill in both.

In *Decimal-Arithmetick* he ought well to underſtand ADDITION, SUBSTRACTION, MULTIPLICATION, DIVISION, and the Rule of PROPORTION.

In *Geometry* he ought to know the three ſorts of *QVANTITY*; that is, a LINE, a SUPERFICIES, and a SOLID.

A Line hath Length, but no Breadth ; a Superficies hath Length and Breadth, but no Depth ; a Solid hath Length, Breadth, and Depth. And there is no kind of *Quantity* but is meaſurable by ſome common Meaſure, as a Line is meaſured by a Line of Inches, or Feet, *&c.* a Superficies is meaſur'd by a Superficies, as one ſquare Inch, or one ſquare Foot, *&c.* and a Solid is meaſured by a Solid, as one Cubical Inch, or one Cubical Foot, *&c.*

So when it is known how many Inches or Feet are contained in a Line, the Length of that Line is ſaid to be known ; and when it is known how many ſquare Inches or Feet are contained within any Superficies, the Content or Area of that Superficies is ſaid to be known ; and alſo when it is known how many Solid or Cubical Inches are contained in any Solid, the Content of that Solid is likewiſe ſaid to be known.

And likewiſe 'tis convenient, before the entring upon *Gauging*, firſt to underſtand the Meaſures of BEER, ALE and WINE now uſed in *England*, and to know what the Primitive Meaſure is, and its Capacity, that thereby may be known the Names and Capacities of thoſe which are Derivative.

Firſt, *Note*, That the Beer or Ale Gallon, now in Uſe, contains 282 Cubical Inches, and the Wine Gallon contains 231 Cubical Inches; alſo the Corn Gallon, or Dry Gallon, contains 272¼ Cubical Inches.

A Table of Beer-Meaſure.

Names of Beer-Veſ.	*Cubical Inches*	*Pints*	*Quar.*	*Gallo.*	*Firk.*	*Kild.*	*Barr.*
Barrel	10152	288	144	36	4	2	1
Kilder.	5076	144	72	18	2	1	
Firkin	2538	72	36	9	1		
Gallon	282	8	4	1			
Quart	70½	2	1				
Pint	35¼	1					

A Table of Ale-Meaſure.

Names of Ale-Veſſ.	*Cubic. Inches*	*Pints*	*Quar.*	*Gall.*	*Firk.*	*Kild.*	*Bar.*
Barrel	9024	256	128	32	4	2	1
Kilder.	4512	128	64	16	2	1	
Firkin	2256	64	32	8	1		
Gallon	282	8	4	1			
Quart	70½	2	1				
Pint	35¼	1					

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A Table of Wine-Meaſure.

Names of Wine Veſ.	*Cubical Inches*	*Pints*	*Quarts*	*Gallons*	*Runlets*	*Hogſheads*	*Tercions*	*Pipes*	*Tun*
A Tun	58212	2016	1008	252	14	4	3	2	1
Pip. or Bu.	29106	1008	504	126	7	2	$1\frac{1}{2}$	1	
Tercion	19404	672	336	84	$4\frac{2}{3}$	$1\frac{1}{3}$	1		
Hogſhead	14558	504	252	63	$3\frac{1}{2}$	1			
Runlet	4158	144	72	18	1				
Gallon	231	8	4	1					
Quart	$57\frac{3}{4}$	2	1						
Pint	$28\frac{7}{8}$	1							

A Table of the Dimenſions of ſeveral Wine and Beer Veſſels uſed in *England*, with their Contents in Gallons and Cubical Inches.

Names of WineVeſ.	*Head Inche.* 100 *Parts*	*Bung Inche.* 100 *Parts*	*Lengt. Inche.* 100 *Parts*	Solid Content.		
				W.Gall.	*A.Gall*	*Cubic. Inches*
Ra.w.Fat	31.15	42.32	70.50	360.00	295.00	83160
Tu. of W.	38.50	42.20	44.00	252.00	206.25	58212
Tun of Oil	36.00	42.00	40.80	236.00	193.50	54516
CanaryP.	21.82	28.65	48.50	116.40	95.40	26888
Bran.Ho.	22.70	25.80	33.50	70.00	57.30	16170
ATercion	23.00	27.00	36.40	84.00	68.80	19404
Grav.H.	22.42	25.40	31.20	63.34	51.80	14631
H.C. Ho.	21.20	23.58	30.82	54.55	44 70	12601
A Terce	16.26	18.30	34.60	42.00	34.30	9702
A Runlet	15.70	17.30	30.70	29.47	24.10	6808
Beer Veſ.						
A Butt	25.00	31.00	46.00	151.80	108.00	30450
Puncheon	23.60	28.30	36.00	77.80	72.00	20304
Hogſhead	22.00	26.00	32.00	66.00	54 00	15228
Barrel	20.20	23.00	27.00	44.50	36.50	10152
Kilderkin	16.10	18.59	21.00	22.30	18 30	5076
Firkin	12.80	14.70	16.60	11.12	9.11	2538
Gallon	7.70	8.50	5.46	1.22	1.00	282
Ale Veſſ.						
A Barrel	19.40	22.00	26.20	39.75	32.55	9024
Kilderkin	15.40	17.60	20.80	20.00	16.40	4522
Firkin	12.20	14.00	16.40	10.00	8.18	2256

To

To find the Area or Content of a Cooler, Back, or Tun, in the form of a Square.

The Rule is,

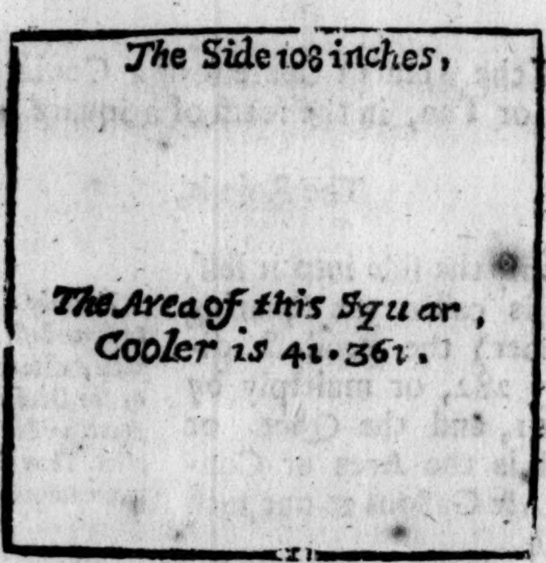
Multiply the ſide into it ſelf, (which is called the ſquaring a Number) the Product divide by 282, or multiply by .0035461, and the Quot. or Product is the Area or Content in Ale Gallons at one Inch in depth.

To make a Multiplier to ſerve inſtead of a Diviſor, divide an Unite by the Diviſor, and the Quot. will be the Multiplier. Thus this Number was made, viz. .0035461

According to the Rule multiply the ſide 108 by 108, and the Product is 11664, which divide by 282, and the Quot. will be 41 Gallons, but in the Diviſion, if a Fraction remain, as in this Example, add 3 Cyphers to it, and ſtill divide by 282, and the Quot. will be the thouſandth part of a Gallon.

A Square is a Figure conſiſting of four equal ſides, and four right Angles, like the face of a Dye, or this Figure, and a Cube is a Solid, erected on ſuch a Plain or Baſe.

See the Work.



If you would have the Area in Wine Gallons, divide by 231, or multiply by .0034.

The ſide 108
108

864
108

Product 11664

282)11664(41 Gallons

1128

384
282

102

282)102000(361 parts.

846

1740
1692

480
282

198

The Area or Content upon one Inch in depth of this ſquare Cooler 41 Gallons and 361 parts, the Gallon being divided into one thouſand parts.

Or thus:

```
                 108
                 108
                 ———
                 864
             108
             ———
     Product 11664
Multiplied by .0035461
      ——————————————
              11664
            69984
           46656
          58320
         34992
     ———————————————
     41.36171904
```

It makes the very ſame as before, cutting off 7 places, or Figures, for the Decimal.

If this ſquare Cooler be 9 Inches deep in Worts, what is the whole Content in Ale Gallons?

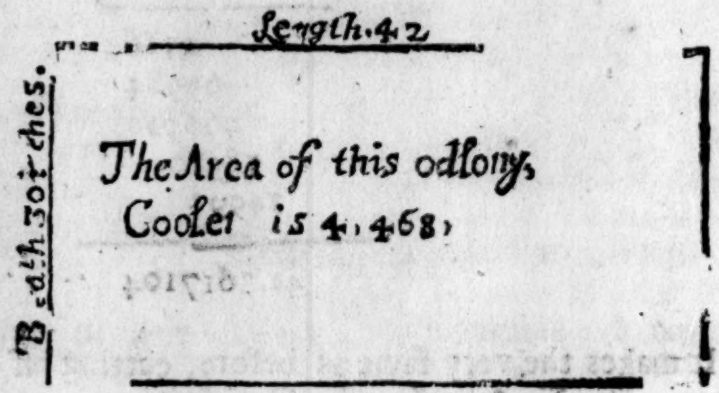
Multiply 41.361 (the Area found) by the depth (9 Inches) ſhews the whole Content of the Worts to be 372.249. Gallons.

To find the Area or Content of a Cooler or Tun in the form of an Oblong, or long Square.

The Rule is,

A Parallelogram is a long or plain Square, and a Parallelopipedon is a solid Figure erected upon that plain.

Multiply the length by the breadth, and the Product multiply by .0035461, or divide by 282, gives the Area or Content upon one Inch in depth in Ale Gallons, and that multiplied by the depth produces the whole Content in Ale Gallons.



Length 42
Breadth 30   282)1260(4 Gall.
Product 1260   1128

132

```
282)132.000(.468 parts
        ...
   1128
   ----
    1920
    1692
    ----
    2280
    2256
    ----
      24
```

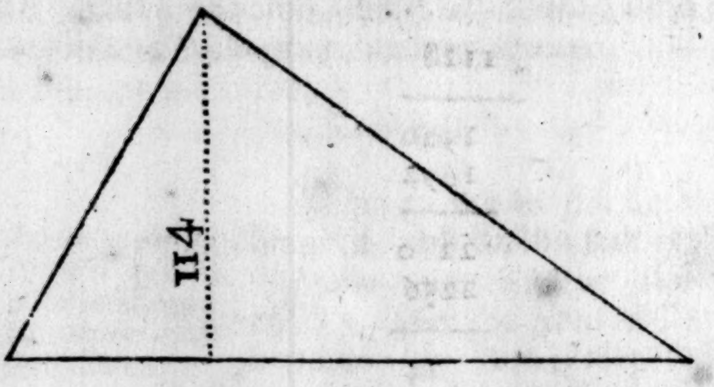
To find the Area or Content of a Back or Cooler in the form of a Triangle.

The Rule is,

The multiplying half the Baſe by the Perpendicular reduces the Triangle into ſquare Inches.

Multiply half the Baſe by the Perpendicular, (or half the Perpendicular by the Baſe) and divide the Product by 282, or multiply by .0035461, and the Quot. or Product is the Area, or Content in Ale Gallons, at one Inch in depth.

The



Note, That all manner of Triangles are meaſured by this general Rule.

The Perpendicular is 114
Half the Baſe is 87
———
798
912
———
The Product is 9918

282)9918(35 Gallons
. .
846
———
1458
1410
———
48

282)48.000(.17 parts
. . .
282
———
1980
1974
———
60

So the Area or Content upon one Inch in Depth of this Triangular Cooler is 35. Gall. 17. parts, the Gallon being divided into an hundred parts.

Admit this Triangular Cooler be 8 Inches deep in Worts, multiply the Area by 8, the Depth, and the Product will be 281.36 parts, the whole Content of Worts therein.

Area 35.17
Multiplied by 8

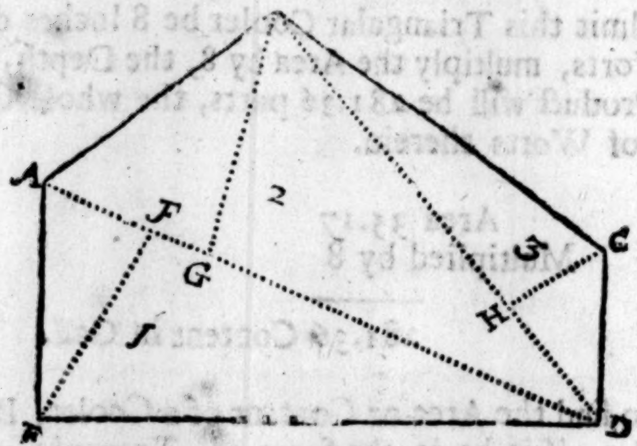
281.36 Content in Gall.

To find the Area or Content of a Cooler, Back, or Tun, if it be in the form of a Trapezia, or of any other irregular form, like this Figure.

A Trapezia is a Figure conſiſting of 9 unequal ſides and Angles, and is compoſed of Triangles, and the Triangles are leſs by two than the number of Sides, and the Diagonals are leſs by 3.

Firſt divide it into Triangles, and then let fall a perpendicular Line in every Triangle, then find the Area of every particular Triangle, (as in the laſt Example) and add the Area of every Triangle together into one Sum, and the Total is the Area, or whole Content, upon one Inch deep of a Cooler, in this form.

To



To make it into Triangles, take ſuch a Line a Carpenters uſe, and Chalk the Line very well, and with Compaſſes or a Nail faſten one end at D, then draw the Line ſtreight to B, and ſo ſtrike out the Diagonal, or Line D. B, and keeping ſtill the Line fixt at the point D, in like manner ſtrike out the Line D. A.

Then meaſure the two Diagonals, or Lines, with a Gauging Rule, and the Line D. A. will be 54 Inches, and the Line D. B. 42.

Then to find the Perpendiculars (in theſe Triangles) faſten the chalked Line at E and draw it ſtreight to the Baſe D. A. and ſo ſtrike out the Perpendicular E. F, then faſten the Line at the point B, and ſtrike the Perpendicular B. G. laſtly faſten the Line at the point C, and get the Perpendicular C. H, then with your Rule meaſure every Perpendicular, as you did the Diagonals.

So

	Inches.		Ale Gall.
So the Baſe of the firſt Triangle is	54	The Area	1.819
And its Perpendicular is	19		
The Baſe of the ſecond Triangle is	54		
And its Perpendicular	24	The Area	2.297
The Baſe of the third Triangle is	42		
And its Perpendicular	13	The Area	0.968
So the Area, or Content, upon one Inch of Depth of this Trapezia, or irregular Cooler, is 5 Gallons and .084 Parts.		Total Sum	5.084

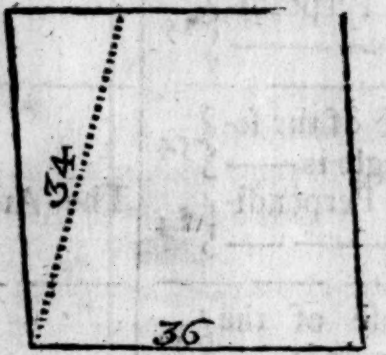
To find the Area or Content of a Cooler or Tun, in the Form of a *Rombus* or a *Romboides*.

Firſt, let fall a perpendicular Line from one of the *Obtuſe* or *Blunt Angles* upon the oppoſite ſide; then multiply the ſide by the perpendicular, and the Product multiply by .0035461, or divide by 282, gives the Area or Content

A Rombus *is a Geometrical Square,*x *bent awry having four equal ſides, but no right Angles; yet the oppoſite Angles are equal,* viz. *two obtuſe and two acute.*

x Rad Bent Rack, out of a Square

Content, upon one Inch, in Ale Gallons. And that multiplied by the Depth, produces the whole Content in Ale Gallons.



The ſide of the *Rombus* 36
Its Perpendicular —— 34

144
108

1224

282(96.000(34 Parts.
846

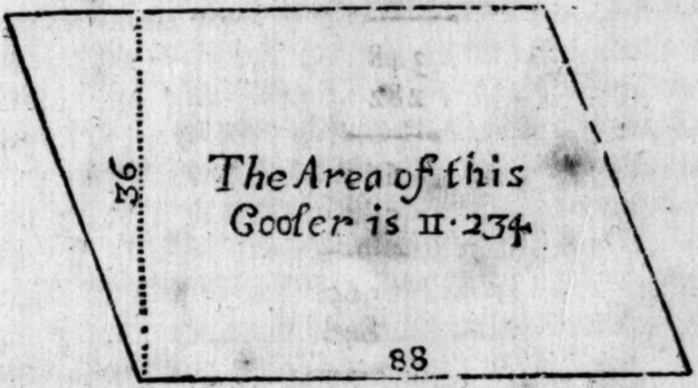
1140
1128

120

282)1224(4 Gallons
1128

96

So the Area of this *Rombus*, is 4 Gallons and 34 Parts.



	Inches.
The ſide of the *Romboides*	88
The Perpendicular	36
	528
	264
Product	3168

A Romboides *is a long Square or* Parallelogram, *out of Square at the Ends, being of unequal Sides and Angles, yet the oppoſite Sides and Angles are equal. And the Content is found by the ſame Rule that the* Rombus *is done by.*

Gall.

282)3168(11.234 Parts.

282

348

282

660

564

960

846

1140

1128

12

Gall.

The Area 11.234

The Depth 14 Inches.

44936

11234

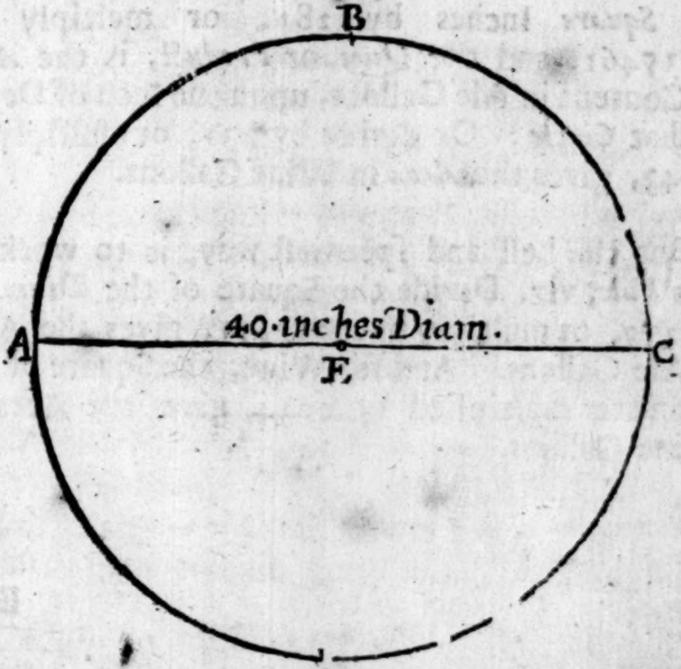
157.276

The whole Content is 157 Gallons, and 276 Parts, the Gallon being divided into a thouſand Parts.

To

To find the Content of a CIRCLE.

A CIRCLE is a plain Figure comprehended or bounded by one Line, which is called the *Circumference* or *Peripheria*, as this Line A. B. C. D. within the very middle of which Line there is a *Point*; and that *Point* is called the *Center*, as the *Point* E; and through which *Center* a right Line, drawn from one ſide of the *Circumference* to the other; and that Line is called the *Diameter*, as the Line A. C. And the two parts of the *Circle*, ſo divided by the *Diameter*, are called *Semi-circles*; and the half of the *Diameter* is called the *Radius* or *Semi-diameter*.



A *Cord* is a right Line, reaching from any part of the *Circumference* to the other, dividing the *Circle* into two unequal parts. A *Segment* is any part of a *Circle* comprehended by the *Circumference*, cut by a *Cord Line*, not touching the *Center.*

Admit the *Diameter* of this *Circle* be 40. Inches, what's the *Area* in *Ale* or *Wine* Gallons?

The Rule is,

Square the *Diameter*, then multiply that *Square* by 11, and divide the *Product* by 14, and the *Quot.* will be the Area in ſquare Inches: Then *divide* the *Square* Inches by 282, or multiply by .0035461, and the *Quot.* or *Product*, is the *Area* or Content in Ale Gallons, upon one Inch of Depth in that *Circle*: Or divide by 231, or multiply by .0043, gives the *Area* in Wine Gallons.

But the beſt and ſpeedieſt way, is to work by this *Rule*, viz. Divide the Square of the *Diameter* by 359, or multiply by .0027851, gives the Area in Ale Gallons. And for Wine, the Square of the Diameter multiplied by .0034, gives the Area in Wine Gallons.

EXAMPLE.

Diameter 40 Inches
40

Squar'd 1600

359)1600(4 Gallons.
1436
164

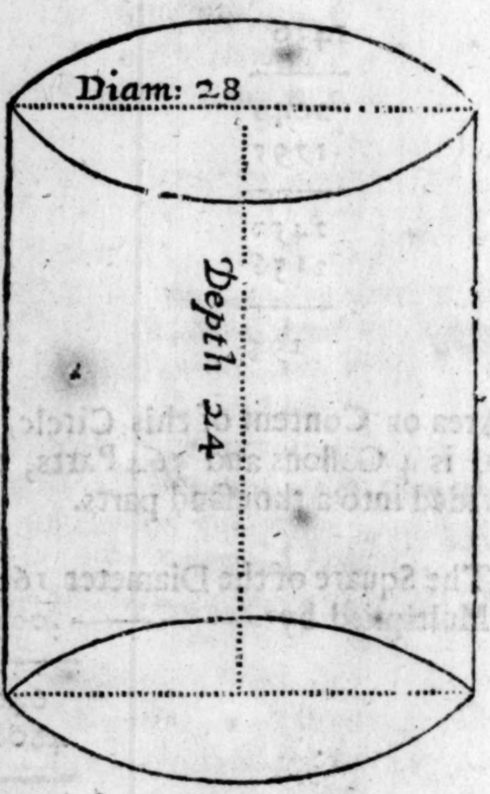
359)164.000(.456 Parts.
1436
2040
1795
2450
2156
294

The Area or Content of this Circle, one Inch in Depth, is 4 Gallons and 564 Parts, the Gallon being divided into a thouſand parts.

The Square of the Diameter 1600
Multiplied by ———— .0034
6400
4800
W.G. Parts.
The Area is ———— 5.4400

If a Cooler or Tun, in the Form of a Cylinder, and the Circles above and below being of equal Diameters. *To find the Content thereof:* Only get the Area of the Diameter, as I have ſhewed in the Circle, and multiply the Area by the Depth, or ſuch parts as you deſire, and the Product will be the whole Content, or part reſpectively.

EXAMPLE.



A Cylinder *is a ſolid Body, with Sides erected, perpendicular on the circumference of a Circle.*

Diam. 28
28

224
56

The Square ——— 784

.0027851
784

111404
222808
194957

A G. parts
The Area 2.1835184
Multiplied by the Depth — 24

87340736
43670368

A. G. parts
The whole Cont. is 52.4044416

Obſerve theſe following *Propoſitions* in order to *Cyclometria*, or the true *meaſuring* of a *Circle*, uſeful when a Queſtion requires great exactneſs.

I. *By the Diameter to find the Circumference? Multiply the Diameter by* 3.1416 *gives the Circumference.*

II. *By the Circumference to find the Diameter? Divide the Circumference by* 3.1416 *gives the Diameter.*

III. *By the Diameter to find the ſide of a Square equal? The Rule is, Multiply the Diameter by* .886227 *gives the ſide of a Square equal.*

IV. *By the Diameter to find the Area? Divide the Square of the Diameter by* 1.27324 *gives the Area in ſquare Inches.*

V. *By the Circumference to find the Area? Divide the Square of the Circumference by* 12.5664 *gives the Area in ſquare Inches.*

VI. *By the Area to find the Diameter? Multiply the Area by* 1.27324, *and extract the Square Root, gives the Diameter.*

VII. *By the Area to find the Circumference? Multiply the Area by* 12.5664, *and extract the Square Root gives the Circumference.*

How to find the Content of a GLOBE, or SPHERE.

Always obſerve, when the Diameter is given to find the Circumference, or having the Circumference to find the Diameter by theſe laſt Rules.

EXAMPLE.

A Globe whoſe Diameter is 12 Inches, what is the Superficial Content round about? *The Rule is*, Multiply the Diameter by the Circumference, and the Product is the Superficial Content.

Thus the Diameter being 12 Inches, which multiplied by 3.1416 ſhews the Circumference to be 37.6992. which multiplied by the Diameter, and the Product will be 452.3904 the Superficial Content thereof.

See the Work.

3.1416
12
62832
31416

The Circumference —— 37.6992
Multiplied by the Diameter—— 12
753984
376992

Is the Superficial Content 452.3904

To find the ſolid Content of the *Globe* or *Sphere*.

Multiply the Superficial Content by one ſixth part of the Globes Diameter, and the Product is the ſolid Content.

Inches ſquare
The Superficial Content is 452.3904
Multiplied by the one ſixth part of the Diam. 2.

The ſolid Content in Cube Inches 904.7808

Another way. Cube the Globes Diameter, then multiply that Cube by 11, and divide the Product by 21, and the Quot. will be the ſolid Content.

Or thus. Cube the Diameter, then multiply the Cube by .5238 (the Solidity of a Globe whoſe Diameter is 1) and the Product ſhall be the ſolid Content.

$$\begin{array}{lr} \text{Diameter} & 12 \\ & 12 \\ \hline & 24 \\ & 12 \\ \hline & 144 \\ & 12 \\ \hline & 288 \\ & 144 \\ \hline \text{Cubed} & 1728 \end{array}$$

$$\begin{array}{lr} \text{The Cube} & 1728 \\ \text{Multipl. by} & .5238 \\ \hline & 13824 \\ & 5184 \\ & 3456 \\ & 8640 \\ \hline \end{array}$$

The ſolid Content 905.1264 near as before.

If it be deſired to know how many Ale Gallons are contained in this Globe? Divide 905.1264 the Cubical Inches therein, by 282. and the Product is the whole Content in Ale Gallons.

```
                    A. G. parts
        282)905.1264(3.2096
              .  ....
            846
            ---
             591
             564
             ----
              2726
              2538
              ----
               1884
               1692
               ----
                192
```

The whole Content is Three Gallons, and almoſt a Quart.

To

To meaſure an Elipſis, *or* Oval.

In the Meaſuring of *Elipſis*, a mean Proportion *Geometrical*, between the longeſt and ſhorteſt *Diameters*, is the Diameter of a *Circle*, equal in *Area* to the *Elipſis*.

Admit the Tranſverſe or longeſt Diameter be 40 *Inches, and the Conjugate or ſhorteſt Diameter be* 30 *Inches.*

The Rule is,

Multiply the *Tranſverſe* by the *Conjugate*, and the *Square Root* of the Product is the true *Diameter* of a *Circle*, equal to the *Elipſis* or *Oval.*

See the Work.

The Square Root extracted.

The Tranſverſe 40 }
Multiplied by the } Inches.
Conjugate 30 }
The Product 1200

```
 ˙ ˙
1200(34.64
9
———
 300
  64
———
 256
———
  4400
   686
———
  4116
———
  28400
   6924
———
  27696
    704
```

Here 34, 64 is the true mean Diameter of an *Eliptical*, or *Oval Tun*, whoſe longeſt Diameter is 40 Inches, and the ſhorteſt 30.

Now having reduced this *Eliptical-Tun* into a *Circular*, the *Area* or whole Content is found as in the Cylinder; an Example is needleſs.

For Practice.

But for Practice, in ſmall Eliptical, or *Oval Tuns*, where the longer and ſhorter Diameters differ but a little, add them together, and take the half for a mean Diameter.

How

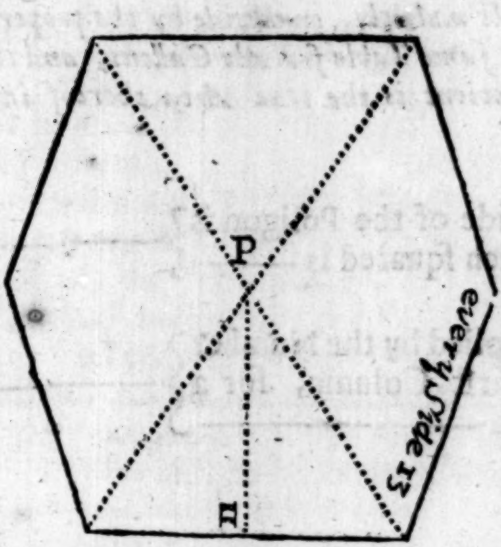
How to find the *Area* of a *Tun*, or *Back*, in the form of a *Regular-Poligon*.

The Rule is,

Regular Poligons taken ſtrictly, are ſuch as have more Sides and Angles than 4, *and are all equal, as the Pentagon, Hexagon, Heptagon,* &c.

Multiply the half Sum of the Meaſures of all the ſides, by the Meaſure of the Line drawn from the Center to the middle of any one ſide, and the Product ſhall be the Superficial Content, in ſquare Inches, which multiplied or divided by the proper Multiplier or Diviſor, in this following Table, gives the Content, or Area in Ale Gallons upon one Inch of depth.

Now to find the Center, do thus, if the ſides of the Figure are even, draw a Line from any Angle to the oppoſite Angle, and cut it again, the interſection of thoſe two Lines is the Center; but if the ſides are odd, draw Lines from the middle of any two ſides being odd, to the oppoſite Angles, and the interſection of thoſe Lines ſhews the Center. Example.



A *Tun*, or *Cooler*, in the form of a *Hexagon*, as this ſix ſided Figure, every ſide being 13 Inches; and from the center to the middle of any one of the ſides, 11 Inches, what's the Area thereof in Ale Gallons.

Six times 13 is 78, the half of which is 39, multiplied by 11, (the Perpendicular, or Radius falling from the center to the middle of any ſide,) and the Product is 429, which multiplied by .0092130 (the Multiplier for a Hexagon) and the Product is 3.852377 the *Area* in Ale Gallons.

Or thus, moſt exactly, Multiply the Square of one of the ſides of the Poligon given, by the Number in the firſt Column of the Table for that Poligon, and the Product multiply, or divide by the proper Numbers in the ſame Table for Ale Gallons, and the Product or Quotient is the true Area thereof in Ale Gallons.

The ſide of the Poligon is 13, which ſquared is ——— } ——— 169

Multiplied by the Number in the firſt Column, for a Hexagon ——— } ——— 2.59808

2338272
1558848
259808

The Product or Area in Inches ——— 439.07552
The Multiplier for Ale Gallons ——— .0092130

1317226560
43907552
87815104
395167968

4.045202765760

So the Area is four Gallons and .045 parts of a Thouſand, being almoſt a fifth part of a Gallon more than the Area is, by the other way of working.

Admit this *Hexagon Tun* be 10 Inches deep in Worts, what's the whole Content?

Multiply the *Area* found by 10 Inches the depth, and the *Product* is the whole Content.

Area 4.045
Mult. by 10

The whole Content--40.450

A Table of Multipliers and Diviſors for Regular POLIGONS.

Poligons.	*Multipliers for Inches.*	*Multipliers for Ale Gall.*	*Diviſors for Ale Gallons.*
Trigon	0 .43301	.0015355	651.250
Tetragon	1 .00000	.0035461	282.000
Pentagon	1 .72048	.0061010	163.908
Hexagon	2 .59808	.0092130	108.542
Heptagon	3 .63391	.0128863	77.602
Octagon	4 .82843	.0171221	58.404
Eneagon	6 .18183	.0219215	45.617
Decagon	7 .69420	.0272844	36.650
Hendegagon	9 .36566	.0332155	30.110
Dodecagon	11.19617	.0307030	25.187

To find the Content of a Piramid.

A *Piramid* is a *Solid*, having one right Lined Baſe (either *Triangular*, *Round*, *Square*, or *Oblong*, &c.) from which it decreaſeth equally leſs and leſs, till it end in a *point* at the *top* or *Vertex*; alſo in the Peripetaſma a right Line may be every where applied from the *Baſe* to the *Vertex*; and under this Definition is comprehended a *Cone*, which is only a round Piramid.

By the *Area* of the Baſe of a PIRAMID, and its *Altitude*, or height, to find the *ſolid Content?*

The Rule is,

Multiply the *Area* of the *Baſe* by one *third* of the *Altitude*, and the Product is the *ſolid Content*.

Gall.

Admit the *Baſe* of a *Sqnare Piramid* be 48 Inches, the Area thereof is } 8.17

And the Altitude 90 Inches, whoſe third part is———————} 30

The *Piramids* ſolid Content in Ale Gallons———————} 245.10

Admit the *Diameter* of a *Cone's Baſe* be 48 Inches, then the *Area* thereof is————————— 6.42
One third of 90, the *Altitude* is ——— 30

192.60

The *Cone's* ſolid Content, is One Hundred Ninety Two Ale Gallons and ſix Tenths.

By the *Altitude* and *Baſe* to find the *HYPOTHENUSE.*

To the Square of the *Altitude* add the Square of half the *Baſe*, and the *Square Root* of the Sum is the *Hypothenuſe*, or ſlant height.

The *Altitude* 90, ſquared is———8100
Half of the *Baſe* 24, ſquared is———576

Total Sum 8676

The Square Root of 8676 is 93.145 the *Hypothenuſe.*

By the *Hypothenuſe* and *Baſe* to find the *Altitude*, or perpendicular height.

From the Square of the *Hypothenuſe* ſubduct the Square of half the *Baſe*, and the Square-Root of the Remain is the *Altitude*, or *perpendicular height*,

This Rule will find the Perpendicular height in leaning Tuns, and may be of good uſe ſometimes.

By the *Hypothenuſe* and *Altitude* to find the *Baſe.*

From the Square of the *Hypothenuſe* ſubduct the Square of the *Altitude*, and the double of the Square-Root of the Remain is the *Baſe*.

There is a Brewers *TUN*, whoſe *Baſes* are *Rectangular Parallelograms*, unequal, but parallel, (and therefore called the *Fruſtum* of a *Piramid.*) Whoſe *Length* of the greater *Baſe* is 84 Inches, and the *Breadth* 68, the Length of the *leſſer* Baſe 69 Inches, and the *Breadth* 58, and the *Depth* of the *Tun* 27 Inches, how many Ale Gallons will this Tun contain?

This is the GENERAL RULE for all Tuns of this ſort.

Take the Area of the greater Baſe, the Area of the leſſer, and a Geometrical Mean betwixt the two Area's, the Sum of theſe three multiplied by one third part of the Tuns depth, gives the Content.

EXAM-

EXAMPLE.

Multiply 84, the Length of the greater *Baſe*, by 68, the Breadth, and divide by 282.

```
         ————
          672 gives the Area of the greater Baſe,
          504
        ————— Gall.
282)    5712 (20.25 Area
         ..
         564
           720
           564
        ————————
         1560
         1410
        ————————
          150
```

Multiply 69, the Length of the leſſer Baſe, by 58, the Breadth, and divide by 282, will give 14.19 Gallons.

To find a *Geometrical Mean*, multiply one Area by the other, and *extract* the *Square-Root*, gives a *Mean* betwixt the two Area's.

20.25
14.19

18225
2025
8100
2025

287.3475 (16. 95, *The Geometrical Mean*

1

187
26 156

31.34
329 2961

17375
3385 16925

450

Area

	Gallons
Area of the greater Baſe is	20.25
Area of the leſſer Baſe is	14.19
The Geometrical Mean	16.95
Tot.	51.39
	9
	462.51

Multiplied by 9, the one third of the Tuns depth gives 462.51 Gallons for the Tuns Content.

The Content may be given very ſpeedily by the ſliding Rule, on the Lines A and B.

As 282 is to 84, ſo is 68 to the Area of the greater Baſe, *viz.* ——————— 20. 25

As 282 is to 69, ſo is 58 to the Area of the leſſer Baſe, *viz.* ——————— 14. 19

To find a *Geometrical Mean* betwixt theſe two Area's, on the Lines C and D, ſet 14.19 upon C, to 14.19 upon D, and then againſt 20.25, upon C, is 16.95 upon D, *So* 16.95 *is a Geometrical Mean betwixt theſe two Area's* ———————————	16. 95 51. 39 9 462.51

There is a Tun whoſe greater and leſſer Baſes are both Eliptical, Parallel, Proportional, and alike Situate, whoſe greater and leſſer Diameters of each Baſe are the ſame Lengths and Breadths of the laſt Tun, and the Depth likewiſe the ſame.

How many Ale Gallons will this Tun contain?

The RULE is,

That is, multiply the Tranſverſe by the Conjugate.

Multiply the length of the greater *Baſe* by the *Breadth*, and the *Square-Root* of the *Product* is a Mean Diameter, then ſquare the ſaid Mean Diameter, and divide by 359.05, gives the true *Area* of the greater *Baſe*; and in the ſame manner find the *Area* of the leſſer *Baſe*.

Then find the *Geometrical Mean* betwixt the *Area's* of the two *Baſes*, as was done in the laſt *Tun*, and multiply the *Total* of the two Area's and the *Mean* by one third part of the *Tuns* depth, (as before) and the Content will be 363.37 Ale Gallons.

But the *Operation* will be the very ſame with the *Sliding Rule*, as the other *Tun* was, only uſing 359 inſtead of 282.

EXAM-

EXAMPLE.

	A. Gallons
As 359 is to 84, ſo is 68 to the Area of the greater Baſe, *viz.* ———	15. 92
As 359 is to 69, ſo is 58 to the Area of the leſſer Baſe, *viz.* ———	11. 14
Set 15.92 upon C, to 15.92 upon D, and againſt 11.14 upon C, is 13.31, the *Geometrical Mean* ———	13. 31
Total	40. 37
Multiply by 9 the one third part of the Tuns depth gives the Content	9
	363.33

There is a *Tun* whoſe *Baſes* are both *ſquare*, but unequal, the ſide of the greater *Baſe* is 120 Inches, the ſide of the leſſer *Baſe* is 104, and the *Depth* 33 Inches.

What's the Content in Ale Gallons?

This *Tun* is the *Fruſtum* of a *Pyramid*, and may be Gauged by the *General Rule* given, only mind to divide by 282.

There is a *Conical Tun*, whoſe Baſes are both *Circular*, and the Diameters of the greater and leſſer *Baſes* and *Depth*, are the ſame of this laſt Tun: *What's the Content in Ale Gallons?*

As this is the Fruſtum *of a Pyramid, 'tis done likewiſe by the General Rule, only dividing by* 359.05.

A *Conical Tun*, whoſe Diameter at the
bottom is —— —— —— ——108 } Inches.
The Diameter at the top is ———93 } Inches.
And the Depth is —— —— ——30 } Inches.

How many Ale Gallons will this Tun contain upon every Inch of the Depth?

Rule is,

Firſt Divide the difference of the bottom and top Diameter by the Depth, and the Quotient is a common Addend. Then find the Area of the Diameter in the middle of every 10 *or* 12 *Inches of the Depth.*

108
93
——
30) 15 (.5 addend
150 5
—— ——
000 2.5

.5
10
——
5.0

.5
——
50

93
2.5
——
95.5 Mean Diameter 5 Inches from top
5
100.5 Mean Diameter 15 Inches from top
5
——
105.5 Mean Diameter 25 Inches from top

$$\text{The Area's of the 3 Diameters}\left\{\begin{matrix}25.40\\28.13\\31.00\end{matrix}\right\}\text{in A. Gall.}$$

Total 84.53
10
——
845.30

Multiply by ten, the one third part of the depth, gives 845.30 for the Content of the Tun.

Or thus, at every 12 Inches.

6	12	9
.5	.5	.5
3.0	6.0	4.5

93
3

96 Mean Diameter 6 Inches from top
6

102 Mean Diameter 18 Inches from top
4.5
106.5 Mean Diameter 27 Inches from top

The Area's of theſe 3 Diameters	Area's	B.	F.	G. parts
	25.67	0	3	0.17
	28.97	0	3	3.47
	31.59	0	3	6.09

25.67
12

5134
2567

308.04
347.64
189.54

845.22 Gallons

28.97,
12

5794
2897
347.64

31.59
6

189.54

B. F. G. parts

24 —— 3 —— 3.72
3 —— 0.17

24 —— 0 —— 3.55
3 —— 0.17

23 —— 1 —— 3.38
3 —— 0.17

22 —— 2 —— 3.21
3 —— 0.17

21 —— 3 —— 3.04
3 —— 0.17

21 —— 0 —— 2.87
3 —— 0.17

20 —— 1 —— 2.70
3 —— 0.17

19 —— 2 —— 2.53
3 —— 0.17

18——3——2.36
3——0.17

18——0——2.19
3——0.17

17——1——2.02
3——0.17

16——2——1.85
3——0.17

Note, 15——3——1.68
3——3.47

14——3——6.71
3——3.47

14——0——3.24
3——3.47

13——0——8.27
3——3.47

12——1——4.80
3——3.47

11——2——1.33
3——3.47

10——2——6.36
3——3.47

9——3——2.89
3——3.47

8——3——7.92

3——3.47

———

8——0——3.45

3——3.47

———

7——0——8.48

3——3.47

———

6——1——5.01

3——3.47

———

5——2——1.54

Note, 3——6.09

———

4——2——3.95

3——6.09

———

3——2——6.36

3——6.09

———

2——3——0.27

3——6.09

———

1——3——2.68

3——6.09

———

0——3——6.09

3——6.09

———

0——0——0.99

This Table of the Conical Tun, is made from the precedent Work.

Inch.	B.	F.	G.part.
0	24	3	3.72
1	24	0	3.55
2	23	1	3.38
3	22	2	3.21
4	21	3	3.04
5	21	0	2.87
6	20	1	2.70
7	19	2	2.53
8	18	3	2.36
9	18	0	2.19
10	17	1	2.02
11	16	2	1.85
12	15	3	1.68
13	14	3	6.71
14	14	0	3.24
15	13	0	8.27
16	12	1	4.80
17	11	2	1.33
18	10	2	6.36
19	9	3	2.89
20	8	3	7.92
21	8	0	3.45
22	7	0	8.48
23	6	1	5.01
24	5	2	1.54
25	4	2	3.95
26	3	2	6.36
27	2	3	0.27
28	1	3	2.68
29	0	3	6.09
30	0	0	0.00

To Inch a Tun, whoſe Baſes, or Top and Bottom Diameters, are unlike, viz. *the Top Eliptical, and the Bottom Circular.*

Admit the Diameter of the *Circular part* at the Bottom be 110.1 Inches; and the *Axis* (or longeſt *Diameter* at the *Top*) of the *Eliptical part* be 110.2, and the ſhorteſt Diameter 101.1, and the Tun's Depth 19.8 Inches.

To Inch this Tun, take with the Long Rule the Croſs-Diameters, in the middle of every 6 or 4 Inches of the Tun's Depth: Thus at 2 Inches from the Top the longeſt Diameter is 110.2 *Inches, and the ſhorteſt* 101.1. *In the middle of the next* 4 *Inches, which is* 6 *Inches from the Top, the longeſt Diameter is* 110.2, *and the ſhorteſt* 103.1 *Inches; and ſo I find the reſt, as are expreſſed in the following Table.*

Now, having theſe Diameters, the *Area* of the *Mean Inch*, in the middle of every 4 Inches may be thus found: *Multiply* the *longer Diameter* by the *ſhorter*, and the ſquare Root of the Product is a *Mean Diameter*. Or divide the Product by 359.05, gives the Area in Ale-Gallons, without extracting the ſquare Root.

```
      110.2
      101.1
     ------
      1102
     1102
   1102
   --------
   . . . . M.Dia.   Area.
   11141.22(105.55—31.02
   1
   ---------
   41110
     205
   -------
    1025
   --------
     11622
      2105
     -------
     10525
     ---------
       109700
        21105
       -------
       105525
       -------
         4175
```

Or work thus by the ſliding Rule: Set 359.05 *upon B, to the longeſt Diameter*, viz. 110.2 *upon A*; *then againſt the ſhorter Diameter upon B, is the Area in Ale-Gallons: Thus againſt* 101.1 *is* 31.02, *the Area of the firſt four Inches*; *againſt* 103.1 *is* 31.64, *the ſecond Area*; *and ſo of the reſt, as in the Table.*

Depth.	*Axis.*	*ſhorter Diameter.*	*Mean Inch in AG*	*Cont. of every 4 Inches of the Tun's Depth in*		
				B.	F.	G. parts.
4	110.2	101.1	31.02	3	2	5.08
4	110.2	103.1	31.64	3	2	7.56
4	110.2	105.1	32.25	3	3	1.50
4	110.2	107.1	32.87	3	3	3.98
3.8	110.2	109.1	33.48	3	2	8.22
19.8		Whole Cont.		18	3	0.84

To find the Drip and Fall of a Tun, and to make Allowance for the ſame in Inching the Tun.

Admit this Tun were ſo placed, that when the Bottom is juſt covered on one ſide, the Liquor is juſt 3.8 Inches deep on the other ſide oppoſite; how much muſt be allowed for the Fall of the Tun? By the Work aforegoing, the Area of the Mean Diameter in the middle of the 3.8 laſt Inches, (that is, at 1.9 Inch from the Bottom) was found to be 33.48, this multiplied by 3.8 makes 127.224 Ale-Gallons, the half of which is 63.61. And ſo much may be allowed for the Drip or Fall of the Tun.

Now, reduce this 63.61 into Barrels, Firkins, and Gallons, and it makes 1 Barrel, 3 Firkins, 4 Gallons, and 11 Parts.

This taken from 18—3—0.84 the Content of
1—3—4.11 the Tun when it
——— ——— ſtands level.
Remains ——— 16—3—5.23

And ſo much will the Tun contain when the Fall or Drip is 3.8 Inches.

16——3——5.23
3——5.52
——— ——— ———
15——3——8.21
3——5.52
——— ——— ———
15——0——2.69
3——5.52
——— ——— ———
14——0——5.67
3——5.52
——— ——— ———
13——1——0.15
Note, 3——6.14
——— ——— ———
12——1——2.51
3——6.14
——— ——— ———
11——1——4.87
3——6.14
——— ——— ———
10——1——7.23
3——6.14
——— ——— ———
9——2——1.09
Note, 3——6.75

8——2——2.84
3——6.75

7——2——4.59
3——6.75

6——2——6.34
3——6.75

5——2——8.09
Note, 3——7.37

4——3——0.72
3——7.37

3——3——1.85
3——7.37

2——3——2.98
3——7.37

1——3——4.11

Here Note, The Remainder at 16 *Inches dry, to be* 1 *Barrel,* 3 *Firkins,* 4 *Gallons, and* 11 *Parts, which argues the Work is done exactly.*

This Table of the Eliptical Tun, is made from the precedent Work.

Dept.	B.	F.	G.
0	16	3	5.23
1	15	3	8.21
2	15	0	2.69
3	14	0	5.67
4	13	1	0.15
5	12	1	2.51
6	11	1	4.87
7	10	1	7.23
8	9	2	1.09
9	8	2	2.84
10	7	2	4.59
11	6	2	6.34
12	5	2	8.09
13	4	3	0.72
14	3	3	1.85
15	2	3	2.98
16	1	3	4.11

How to Gauge a Copper, and make allowance for the riſing Crown.

Admit the Diameter at the top be 109. 5 Inches, the Diameter at the bottom of the Crown 83. 3 Inches, and Depth of the whole Copper 40. 1 Inches, the Diameter which touches the Vertex or top of the Crown 89.7 Inches, and the Altitude of the riſing Crown 7.3 Inches.

I demand the whole Content of the Copper from the top, to the Vertex of the riſing Crown? And the Content of the Liquor that juſt covers the Crown?

And laſtly, What it holds upon every 6 Inches from the top to the Vertex of the riſing Crown?

The Rule is,

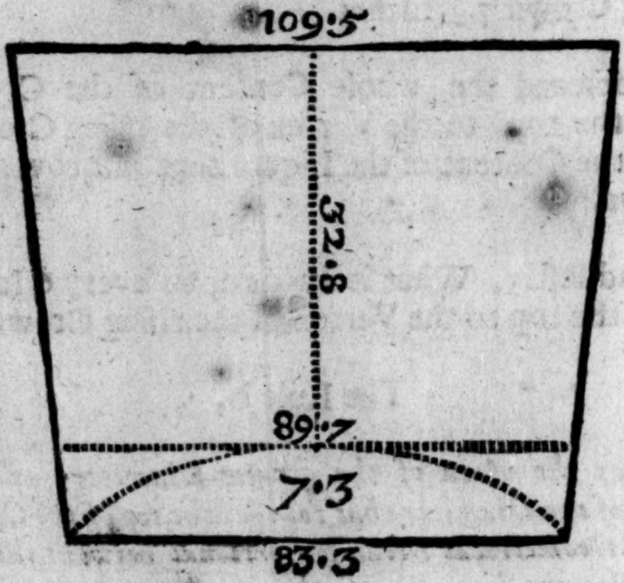
Take the Area of the greater Diameter, and the Area of the Diameter that touches the top of the Crown, and a Geometrical Mean proportional betwixt the two Area's, the Sum of theſe three multiplied by one third part of the depth from the top, to the Vertex of the Crown, gives the Content of that part, or ſo much will the Copper contain after the Crown is juſt covered.

The Rule to find the Content of the riſing Crown is,

Multiply the Area of the Diameter of the bottom of the Crown, by half the Crowns Altitude, gives the Content of the Crown.

Then ſubſtract the Content of the Crown from that part of the Diameter at the Vertex to the Diameter at the bottom, and the Remain is the quantity of Liquor that will juſt cover the Crown.

EXAMPLE.



```
              109.5
              109.5
             ------
              5475
             9855
            1095
           -------Gall. parts
     359)11990.25(33.399
             ...
           1077
         --------
              1220
              1077
           --------
              1432
              1077
           --------
               3555
               3231
           --------
                3240
                3231
                0009
```

```
        89.7
        89.7
       ------
        6279
       8073
      7176
    --------- Gall.
359)8046.09(22.412
       ..  ..
    718
    ----
     866
     718
     ----
     1480
     1436
     -----
       449
       359
       -----
        900
        718
       -----
        182
```

The Area at the top——33.399
The Area at the Vertex–22.412
The Geometrical Mean—27.400

The Total————————83.211
Multip. by $\frac{1}{3}$ of the Depth 10.933

Cont. from the top to the Crown's Vertex 909.745863

83.3
83.3

2499
2499
6664

359)6938.89(19.328 *Area at the bottom of the Crown.*

359

3348
3231
1178
1077

1019
718

3010
2872

138

19.328 *multiplied by* $\frac{1}{2}$ *the Crown's Altitude.*
3.65

96640
115968
57984
70.54720 *the Content of the Crown.*

Now the Area of the Vertex is——22.412
And the Area at the bottom is——19.328

Total 41.740 Gallons

The half of theſe two Area's is ——20.87
Multiplied by the Crown's Altitude—7.3

6261
14609

152.351

Which makes 152.351 Gallons, from which ſubſtract 70.5472, the Crown's Content, and the Remain will be the Liquor which will juſt cover the Crown.

EXAMPLE.

152.351
70.5472

Gallons 81.8038

Now to 909.745863
add———81.8038

———·———

991.549663

Which ſhews that 991 *Gallons and a half is the Coppers Content.*

To know what the Copper holds upon every 6 *Inches from the top to the Vertex of the Crown.*

The Rule is,

Divide the difference of the top and Vertex Diameters, by the depth from the top to the Vertex, and the Quotient is a common Subducend.

Then find the Area's of the Diameters in the middle of every ſix Inches of the depth, and laſtly, multiply each Area by its particular depth, gives the true Content upon every ſix Inches, and the odd parts.

Why is 282 *the Diviſor for a Square?* Becauſe 282 Cubical Inches are an Exchequer Gallon of Ale.

Why is 16.79 *the Gauge point for a Square?* Becauſe it is the Square Root of 282, or ſo many Inches in Diameter, is juſt one Gallon upon a Square, in one Inch deep in Liquor.

Why is 231 *Diviſor for Wine upon a Square?* Becauſe 231 Cubical Inches are an Exchequer Gallon of Wine.

Why is 15.199 *the Gauge point for Wine upon a Square?* Becauſe it is the Square Root of 231, or ſo much in Diameter of a Square, is juſt a Wine Gallon upon one Inch deep in Liquor.

Why is 18.9487 *the Gauge point for Ale upon a Circle?* Becauſe a Circle of that Diameter is juſt one Gallon upon one Inch deep in Liquor, *(and that it is the Square Root of* 359.05*)*

Why is 17.1498 *the Gauge point for Wine upon a Circle?* Becauſe a Circle of that Diameter one Inch deep in Liquor is juſt a Wine Gallon, *(and it is the Square Root of* 294.1*)* the Diviſor for a Circle.

Why is 359.05 *the Diviſor in Ale Gallons for a Circle?* Becauſe it is the Square of 18.9487, *the Gauge point for a Circle.*

Why is 294.1 *the Diviſor in Wine Gallons for a Circle?* Becauſe it is the Square of 17.149, the Gauge point for a Circle.

A Spheroidical Caſk whoſe Bung Diameter is 27.5 *and Head* 23.8 *and the length* 32, what's the Content in Ale Gallons.

The Rule is,

To the double Square of the Bung Diameter add the Square of the Head Diameter, and the Total divide by 1077, then multiply that Quotient by 32, (the Length) gives the Content of the Caſk in Ale Gallons.

But why is 1077 *the Diviſor?* Becauſe it is the trible of 359, *(the Diviſor for a Circle in Ale Gallons.)*

What is the Content of the ſaid Cask in Wine Gallons?

The Work is the ſame, only inſtead of 1077 divide by 882.3, becauſe it is the trible of 294.1, *(the Diviſor for a Circle in Wine Gallons.)*

How to find a *Gauge-point* for any *Meaſure*, either *Liquid* or *Corn Meaſure*; firſt note, That 272.25 Cubical Inches is a Corn Gallon, or a Gallon of Malt, but the Goods or Grains of indifferent Malt, and of indifferent grinding, when three Worts have paſſed through it, it is more compact by about a ſixth part; ſo in the South and Weſt parts of *England* 227 may be ſaid to be a Gallon, or a Diviſor proper for a ſquare Maſh Tun, and 288 for a round Maſh Tun; but in *Yorkſhire* and the Northern Counties, indifferent Malt and of indifferent grinding is compact but about an eighth part; ſo 238 may be ſaid to be a Gallon there, or the Diviſor proper for a ſquare Maſh Tun, and 303 for a round Maſh Tun.

Yet the Diviſors are to be altered by the Superviſor, according to the Country Malt made uſe of; for his *Experience* in this Caſe will be the beſt *Director.*

So the Square Root of 227 is the Gauge point for ſquare Maſh Tuns of the South and VVeſt Country Malt, and the Square Root of 288 is the Gauge point for round Maſh Tuns.

Likewiſe 238, the Square Root of which is the Gauge point for ſquare Maſh Tuns in *Yorkſhire* and the Northern Counties, and the Square Root of 303 is the Gauge point for round Maſh Tuns.

The Square Root of the Cubical Inches of either Ale, VVine, or Corn Gallon, is the Gauge point for Gallons, and likewiſe the Square Root of the Cubical Inches in a Buſhel or Quarter, is the Gauge point for *Buſhels* and *Quarters.*

Note, That eight Corn Gallons is a *Buſhel*, and eight *Buſhels* is a *Quarter.*

How to turn Gallons of Ale into Gallons of VVine.

EXAMPLE.

In 27 Gallons of Ale, how many Gallons of VVine?

By the Rule of THREE.

```
9 . 11 :: 27 . 33
     27
    ----
  ) 297 (33 VVine Gallons.
     ..
    27
    ----
     27
     27
    ----
     00
```

Note that the Proportion between 9 and 11 is found by multiplying 282 by 9, and dividing the Product by 231.

In 33 Gallons of VVine how many Ale Gallons?

11. 9 :: 33. 27
9

11) 297 (27
22

77
77

00

The *Area* of a CIRCLE being 4.2 Ale Gallons, what's the Diameter of the ſaid *Circle?*

Multiply the Area by 359.05, and the Square Root of the Product gives the Diameter of the CIRCLE.

Of Cask Gauging.

M*oſt Writers* and *Artiſts* Treating on this Subject do give their *Opinion*, that every common Cask, (as *Butts*, *Pipes*, *Hogſheads*, *Barrels*, and ſuch like) are in the Form of theſe four *Solids*, viz.

Either of the middle Fruſtum of a Spheroid, or the middle Fruſtum of a Parabolical Spindle.

Or the middle Fruſtum of two Parabolical Conoids abutting upon one common Baſe, or the middle Fruſtum of two Cones abutting upon one common Baſe.

Which by theſe 4 Rules following, the Content of any Cask may be found very near the Truth.

EXAMPLE. I.

A Cask that is in the form of the middle Fruſtum of a Spheroid,

$$\left.\begin{array}{l}\text{Whoſe Bung Diameter is———32}\\ \text{Head Diameter is——— ———25}\\ \text{And the Length——— ———45}\end{array}\right\}\text{Inches.}$$

What's the Content in Ale or Wine Gallons?

The Rule is,

To the Sum and half Sum of the Squares of the Bung and Head Diameters, add half the difference of the ſaid Squares, the Sum multiply by the length, and divide the Product by

$$\left.\begin{array}{r}1077\\ 882\end{array}\right\}\textit{the Quotient is}\left\{\begin{array}{l}\textit{Ale}\\ \textit{Wine}\end{array}\right\}\textit{Gallons.}$$

The Square of 32 is ——— 1024
The Square of 25 is ———-625

The Sum is ——— ———-1649
The half Sum is——— ——824.5
Half the diff. of the Square 199.5

The Sum is——— ———–2673
Multiplied by the length — 45

Divided by–1077)120285(111.67 *the con. in A. G.*

EXAMPLE II.

Admit a Cask of the ſame Diameters and Length, in the form of the middle Fruſtum, of a Parabolical Spindle, *(a Cask whoſe Staves betwixt the Bung and Head are leſs curved by about one third part than the Spheroid)*

How many Gallons will this Cask contain?

The RULE is,

To the Sum and half Sum of the Squares the B and H Diameters, add 3 tenth parts of the difference of the ſaid Squares, the Sum multiply by the Length, and divide as before, gives the Content in Ale or Wine Gallons reſpectively.

The Sum of the Squares is——1649
The half Sum is—— —— ——824.5
The 3 tenth parts of the difference of the Squares is } 119.7
——————
The Sum of theſe is——— ——2593.2
Multiplied by the Length—— ——45
——————
And divided by-1077)116694:0(108,34 *con.in A.G.*

EXAMPLE III.

Admit a Cask of the ſame Diameters and Length, as before, in the form of the middle Fruſtum of two Parabolical Conoids, *a Cask whoſe Staves betwixt the B and H have little Curveture, lying nearer to the ſtreight Line than to the curved)*

What's the Content of ſuch a Cask?

The Rule is,

To the Sum and half Sum of the Squares of the B and H Diameters, add one tenth part of the difference of the ſaid Squares, the Sum multiply by the Length, and the Product divide, as in the firſt Example, gives the Content in Ale or Wine Gallons reſpectively.

The Sum of the Squares is———1649
The half Sum is——————824.5
One tenth part of the difference of the Squares is——— } 39.9

The Sum of theſe is————2513.4
Multiplied by the Length——— 45

Product div. by 1077)113103.0(105.01 *cont. A. G.*

EXAMPLE IV.

Suppoſe a Cask of the ſame Diameters and Length ſhould be in the form of the middle Fruſtum of two Cones abutting upon one common Baſe.

What will be the Content of ſuch a Cask in Ale or Wine Gallons?

The Rule is,

From the Sum and half Sum of the Squares of the B and H Diameters ſubſtract half the Square of the difference of the Diameters themſelves, and multiply the Remainder by the Length, and divide the Product, as in the firſt Example, gives the Content in Ale or Wine Gallons reſpectively.

The Sum of the Square is——1649
The half Sum is —— —— ——824.5

The Sum of theſe is—— ——2473.5
The half the Square of the difference of the Diameters ſubſtracted —— —— —— —— } 24.5

The Remain is —— —— —— 2449.0
Multiplied by the Length —— ——45

Product divided by 1077)110205(102.42

Now 't is plain by theſe four Rules, that if the Dimenſions of a Cask

Be { Bung Diameter 32
Head Diameter 25
and the Length 45 } Inches.

That the Contents of theſe four ſorts of *Casks* are as followeth,

	Gallons	*Diff.*
I. *As a Spheroid* —— —— —— ——	111.67	3.33
II. *As a Parabolical Spindle* —— ——	108.34	3.33
III. *As the middle Fruſtum of 2 Conoids*	105.01	2.59
IV. *As the middle Fruſtum of two Cones*	102.42	

Obſerve here, That the Difference between the Content of the firſt and ſecond, is equal to the *difference* between the ſecond and third, and the *difference* between the third and fourth are ſcarce 3 *Quarts* leſs than the other, which indeed it ought to be ſomewhat leſs, becauſe the *Staves* betwixt the

Bung and *Head* are little *curved*, and lie near to the ſtreight *Line*, which *plainly demonſtrates* theſe *four Rules* to be very near the *Truth*.

Yet it may be ſuppoſed that a *Cask* of theſe Diameters and Length may contain ſome certain quantity betwixt the Contents here found, but in ſuch Caſes proceed by the Rule given, adding 1, 2, 3, 4, or 5 tenth parts of the difference of the Squares, as Judgment and the ſhape of the *Cask* ſhall direct.

And the like Caution muſt be obſerved in the finding the Mean Diameter, *(or reducing the Cask into a Cylinder)* if you work by the ſliding Rule.

For a Cask		*The Multiplier is*
	Much Bulging	.75
	as a Spheroid	.7
	Parabolick	.6
	Conical	.5

So between .8 tenths and .5 tenths will all Casks happen that are hooped.

Of a Standing Cask part empty.

A Cask ſuppoſed to be the middle Fruſtum of a Spheroid, ſtanding upon one Head, with its Axis perpendicular to the Horizon,

Whoſe *Bung Diam. is* 26.8 *Inches.*
Head Diam. is 23.3
Length —— 30 6

And 7.5 Inches being dry, or wanting ſo much of being full,

What's the Quantity of the Liquor in the Cask?

Divide the difference of the Area's of the Bung and Head Diameters, by trebble the Square of half the Casks length, then multiply the Quotient by the Square of the Inches from the plain of the Bung to the Liquors ſurface, and the Product ſubducted from the Area of the Bung Diameter, will leave the Area of a Mean Circle, which multiplied by the diſtance from the plain of the Bung to the ſurface of the Liquor, gives the Content betwixt the Bung and Surface.

Which ſubducted from half the Content, the Remain will be the Gallons required to fill the Cask.

Half the Casks Length 15.3
15.3 *ſquar'd*

459
765
153

234.09
3 *trebbled*

702.27

```
                                   Gallons
The Area of B. Diam. is 2.0003
The Area of H. Diam.—1.512
                        ———————
Divided by ——702.27).488300000(.0006953
                     421362···         60,84
                     ———————          ———————
                     669380            27812
                     632043           61624
                     ———————         41718
                      373370         ———————————
                      351135         .042362052
                     ———————
                      222350
                      210681
                     ———————
                       11669

Bung Area————————2.0003
                  .042362052
The Area of a M Circle—1.957937948
                        ———————————
Multiplied by the Inches from the }
   Bung to the Liquors ſurface——  } 7.8
                      ———————————
                       15663503584
                      13705565636
                      ———————————
                      15.2719159944
```

Here it is 15 Gallons, and 27 parts, as by the other Rule.

If the Diameter of the Surface of the Liquor be known, then to the double Area of the Bung Diameter *add the Area of the Diameter of the Liquors ſurface, and a third part of the Sum is the Area of a* Mean Circle.

How to find the *Ullage*, or vacant Fruſtum of a *Cylindrical Cask*, partly full, lying with its *Axis* parallel to the *Horizon*.

EXAMPLE.

A Cask whoſe Content is 80 *Gallons*
The Bung Diameter——29 *Inches*
The dry Inches————13
The wet Inches————16

The Rule is,

Divide the wet or dry Inches by the Bung Diameter, adding two (or more) Cyphers, and the Quotient ſeek under the Title V. S. gives a Segment, which multiplied by the whole Content of the Cask, gives the Quantity of the Liquor in the Cask, or the Gallons wanting.

```
29)13.00(.44
      ..    1
     116   ——
     ——    45
     140
     116
     ——
      24
```

.4364
80
34.9120

Here 13 divided by 29, the Quotient is but 44, and 24 is the *Remain*; ſo always obſerve that when the *Remain* is above half the *Diviſor*, add one to the *Quotient*; now againſt 45 in the Table of *Segments*, under V. S. gives .4364, which multiplied by 80, *(the whole Content of the Cask)* the Product is 34 Gallons, and nine tenth parts of a Gallon, and ſo much the Cask wants of being full

29)16.00(.55
145
150
145
5

Here the Quot. is 45, *againſt which in the Table of Segments is* ———————— .5636

Which multiplied by 80 the Content, gives the Liquor in the Cask ———————— 80

45.0880 Liquor in the Cask
34.912 Liquor wanting
80.0000

A Table *of the* Segments *of a Circle.*

V.	*Area.*	*V.*	*Area.*	*V.*	*Area.*	*V.*	*Area.*
1	.0017	99	.9983	26	.2066	74	.7934
2	.0048	98	.9952	27	.2178	73	.7822
3	.0087	97	.9913	28	,2292	72	.7708
4	.0134	96	.9806	29	.2407	71	.7593
5	.0187	95	.9813	30	.2523	70	.7477
6	.0245	94	.9755	31	.2640	69	.7360
7	.0308	93	.9692	32	.2759	68	.7241
8	.0375	92	.9625	33	.2878	67	.7122
9	.0446	91	.9554	34	.2998	66	.7002
10	.0520	90	.9480	35	.3119	65	.6881
11	.0598	89	.9402	36	.3241	64	.6759
12	.0680	88	.9320	37	.3364	63	.6636
13	.0764	87	.9236	38	.3487	62	.6513
14	.0151	86	.9149	39	.3611	61	.6389
15	.0941	85	.9059	40	.3731	60	.6265
16	.1033	84	.8967	41	.3860	59	.6140
17	.1127	83	8873	42	.3986	58	.6014
18	.1224	82	.8776	43	.4112	57	.5888
19	.1323	81	.8677	44	.4238	56	.5762
20	.1424	80	.8576	45	.4364	55	.5636
21	.1527	79	.8473	46	.4491	54	.5509
22	.1631	78	.8369	47	.4618	53	.5382
23	.1737	77	.8263	48	.4745	52	.5255
24	.1845	76	.8155	49	.4873	51	.5127
25	.1955	75	.8045	50	.5000	50	.5000

Note, *That the Tables of Segments are made only for a Cylinder, but the Line of Segments on the Sliding-Rule is made for a Spheroid, and therefore is more exact for all Bulging Casks, and the Tables of Segments only proper for a* Cylindrical Cask.

A *ſpeedy way (by the Pen)* how to find the *Vllage*, or *vacant Fruſtum* of either a *Spheroidical* or *Cylindrical Cask*, with its *Axis* lying parallel to the *Horizon*, without either *Rule* or *Table* of *Segments*.

The Rule is,

For a *Cylindrical Cask*, divide the wet or dry Inches by the Bung Diameter, as before, if the Quot. be under Fifty, ſubſtract from the Quot. a fourth part of that number, which would make it Fifty, and the Remain multiply by the content, But if the Quot. be above Fifty, then add a 4th part of that number, which is above 50, to the *Quot.* and the Total multiply by the *Content*.

Note, That if the Quot. proves under 20, *or above* 80, *inſtead of one fourth part add or ſubſtract one fifth part.*

For Example.

The ſame Cask as was laſt, Content 80 *Gallons,*

Bung 29 }
Dry 13 } *Inches.*
Wet 16 }

```
29)13.00  (.44
     ..      1
    116    ----
  ------    .45
    140     125
    116    -----
     24    .4375
              80
           ----------
           35.0000
              .05
           ----------
           34.9500
```

The Quot. wants five of Fifty, ſo ſubſtract 125, the fourth part of five from 45, and the Remain is .4373, which multiplied by the Content, gives 35 Gallons for the dry Inches, which is too much by 5 parts of an hundred parts of a Gallon, *becauſe (in dividing)* 24 *went for* 29, therefore ſubſtract the ſaid 500 parts from 35 Gallons, and the Remain will be 34.95 Gallons, the true *Content* of the dry Inches.

```
29) 16.00 (.55
      ..     125
     145   ———
———————— .5625
     150      80
     145   ———
———————— 45.0000
       5    .05
          ————
          45.0500
```

Here the Quot. is 5 above Fifty, therefore I add a fourth part of five to 55, the Quot. and multiplies the Sum by the Content, gives 45 Gallons of the wet Inches, which is too little by 5 of an hundred parts, becauſe five remained in the Diviſion, therefore I add the ſaid 5 parts of an hundred to 45, which make 45.05 Gallons, the *true Content* of the wet Inches.

	Gall.
So the Content of the dry Inches is———	34.95
And the Content of the wet is———	45.05
	80.00

Which is the ſame as with the Table of Segments.

Now as a *Spheroid*, or *Bulging Cask*, ſubſtract, or add one third part, inſtead of one fourth part, and multiply as before, by the Content, *&c.*

EXAMPLE.

A Spheroidical Cask whoſe Content is 64 Gallons.

The Bung Diameter is ——— 27 } Inches.
Dry Inches is ——— 11 } Inches.
The wet is ——— 16 } Inches.

```
27)11.00(.40
    ..    1
   108   ——
  ————————.41
   20     3
         .38
          64
         ————
          152
         228
        ——————
        24.32
          .7
        ——————
        23.62
```

Here the Quot. wants 9 of Fifty, ſo the third part of 9 is 3, which ſubſtracted from 41, and remains 38, which multiplied by 64, *(the Content)* gives 24.32 for the *Gallons wanting*, yet it is .7 tenths of a Gallon too much, becauſe (in dividing) 20 went for 27, ſo .7 tenths muſt be ſubſtracted out of 24.32, and the Remain 23.62, the *exact Quantity of the dry Inches.*

```
27)16.00(.59
      ..    3
    135   ——
———————.62
     250  64
     243  ——
       7 248
         372
      ———————
       39.68
          .7
      ———————
       40.38
```

Here the Quot. is 9 above 50, ſo add one third of 9 to 59, the Quot. and multiply the Sum by 64, (*the Content*) gives 39.68 Gallons for the *Content of the wet Inches*, which is too little by .7 *tenths* of a Gallon, becauſe ſeven remained in the *Diviſion*, therefore add .7 *tenths* to 39.68, and it makes 40 38 parts, the *true Content* of the wet Inches.

The Three uſeful Problems by M. D.

BY the Head Diameter, Length and Content, to find the Bung Diameter, as a *Spheroid?*

Multiply the Content by 1077.16, *and divide the Product by double the Length, and from the Quot. ſubſtract half the Square of the Head Diameter, and the Square-Root of the Remain is the Bung Diameter.*

Note, That 1077.16 *is thrice the Square of the Gauge-Point.*

By the Length, Content, and Bung Diameter, to find the Head Diameter?

Multiply the Content by 1077.16, *and divide the Product by the Length, and from the Quot. ſubſtract twice the Square of the Bung Diameter, and the Square-Root of the Remain is the Head Diameter.*

By the Bung and Head Diameters, and Content, to find the Length of the Cask?

Multiply the Content by 1077.16. *and divide the Product by twice the Square of the Bung, and once the Square of the Head Diameters, in one Sum, the Quot. will be the Length of the Cask.*

The

The Uſe of the following Table of CYLINDERS.

IN the top of the Table are placed the Diameters in Inches and Tenths, from 8 Inches to 60 in Diameter, beginning in the 8th. Page of the Table, .1 .2 .3 .4 .5 .6 .7 .8 .9, which is 8 Inches and 2 Tenths, 8 Inches and 3 Tenths, *&c.*

On the top of each Page in the firſt Column on the Left Hand is the depth of the *Cylinder*, beginning .1 .2 .3, *&c.* to 31 Inches in depth.

The Number in the other Columns is the Content in Ale Gallons, and hundred parts, anſwering to the Diameter at the top of the Table, and the Depth of the firſt Column in the ſide of the Table.

EXAM-

EXAMPLE.

Suppoſe the Diameter be 26.5 *Tenths of an Inch, the Depth* 14.7 *Tenths of an Inch?*

In the top of the Table find 26.5*, underneath which, againſt* 14 *in Inches is* ———————— 27.38
And againſt .7 *Tenths of an Inch is* ———— 1.37

28.75

Which being added together makes 28.75*, that is,* 28 *Gallons, and* 75 *parts of a Gallon, or Three Quarts.*

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29 JA63

H

A
TABLE
OF
Cylinders.

From 8 to 60 Inches in Diameter, and 31 Inches in Depth, Calculated to every Tenth of an Inch in Diameter, and to every Tenth of an Inch in Depth: Very ready, and of excellent Uſe for all Officers to caſt up their Gauges.

By *GEORGE WARD*, Gauger.

4

BRITISH MUSEUM

Cylinders in Ale-Gallons.

	8	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.02	0,02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
.2	0.04	0.04	0.04	0,04	0.04	0.04	0.04	0.04	0.04	0.04
.3	0.05	0.05	0.06	0.06	0.06	0,06	0.06	0.06	0.06	0.07
.4	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09
.5	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11
.6	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13
.7	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.15
.8	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.18
.9	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.20
Area.	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.22	0.22
2	0.36	0.37	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44
3	0.53	0.55	0.55	0,58	0.59	0.60	0.62	0.63	0.65	0.66
4	0.71	0.73	0.75	0.77	0.79	0,80	0.82	0,84	0.85	0.88
5	0.89	0.91	0.94	0.96	0.98	1.01	1.03	1.05	1.08	1.10
6	1.07	1.10	1.12	1.15	1.18	1.21	1.24	1.26	1.29	1.32
7	1.25	1.28	1.31	1.34	1.38	1.41	1.44	1.48	1.51	1.54
8	1.43	1.46	1.50	1.53	1.57	1,61	1.65	1.69	1.73	1.76
9	1.60	1.64	1.69	1.73	1.77	1.81	1,85	1.90	1.94	1.99
10	1.78	1.81	1,87	1.92	1.96	2.01	2,06	2.11	2.16	2.21
11	1.96	2.01	2.06	2.11	2.16	2.21	2.27	2.31	2.37	2.43
12	2.14	2.19	2.23	2.30	2.36	2.41	2.47	2.53	2.59	2.65
13	2,32	2.37	2.43	2.49	2.55	2.62	2.68	2.74	2.80	2.87
14	2.49	2.56	2.62	2.69	2.75	2.82	2.88	2.95	3.02	3.09
15	2.67	2.74	2.81	2.88	2.95	3.02	3.09	3.16	3.24	3.31
16	2.85	2.92	3.00	3.07	3.14	3.22	3.30	3.37	3.45	3.53
17	3.03	3.11	3.18	3.26	3.34	3.41	3.50	3.58	3.67	3.75
18	3.21	3.29	3.37	3.45	3.54	3.62	3.71	3.79	3.88	3.97
19	3.39	3.47	3.56	3.65	3.73	3.82	3.91	4.00	4.10	4.19
20	3.56	3.65	3.75	3.84	3.93	4.02	4.12	4.22	4.31	4.41
21	3.74	3.84	3.53	4.03	4.13	4.22	4.33	4.43	4.53	4.63
22	3.92	4.02	4.12	4.22	4.32	4.43	4.53	4.64	4.75	4.85
23	4.10	4.20	4.31	4.41	4.52	4.63	4.74	4.85	4.96	5.07
24	4.28	4.38	4.49	4.61	4.72	4.83	4.94	4.96	5.18	5.29
25	4.46	4.57	4.68	4.80	4.91	5.03	5.15	5.27	5.39	5.51
26	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.48	5.61	5.74
27	4.81	4.93	5.06	5.18	5.31	5.43	5.56	5.69	5.82	5.95
28	4.99	5.12	5.24	5.37	5.50	5.63	5.77	5.90	6.04	6.18
29	5.17	5.30	5.43	5.56	5,70	5.83	5.97	6,11	6.26	6.40
30	5.35	5.48	5.62	5.75	5.89	6.04	6.18	6.32	6.47	6.62
31	5.52	5.66	5.81	5.95	6.09	6.24	6.39	9.53	6.69	6.84

5

Cylinders in Ale-Gallons.

	9	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
.2	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
.3	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08
.4	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.11	0.11
.5	0.11	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14
.6	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16
.7	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.19	0.19
.8	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.21	0.22
.9	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.24	0.24	0.25
Area.	0.23	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27
2	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.55
3	0.68	0.69	0.71	0.72	0.74	0.75	0.77	0.79	0.80	0.82
4	0.90	0.92	0.94	0.96	0.98	1.01	1.03	1.05	1.07	1.09
5	1.13	1.15	1.18	1.20	1.23	1.26	1.28	1.31	1.34	1.36
6	1.35	1.38	1.41	1.45	1.48	1.51	1.54	1.57	1.60	1.64
7	1.58	1.61	1.65	1.69	1.72	1.76	1.80	1.83	1.87	1.91
8	1.80	1.84	1.89	1.93	1.97	2.01	2.05	2.10	2.14	2.18
9	2.03	2.08	2.12	2.17	2.21	2.26	2.31	2.36	2.41	2.46
10	2.26	2.31	2.37	2.41	2.46	2.51	2.57	2.62	2.67	2.73
11	2.48	2.54	2.59	2.65	2.71	2.77	2.82	2.88	2.94	3.00
12	2.71	2.77	2.83	2.89	2.95	3.02	3.08	3.14	3.21	3.28
13	2.93	3.00	3.06	3.13	3.20	3.27	3.34	3.41	3.48	3.55
14	3.16	3.23	3.30	3.37	3.45	3.52	3.59	3.67	3.74	3.82
15	3.38	3.46	3.54	3.61	3.69	3.77	3.85	3.93	4.01	4.09
16	3.61	3.69	3.77	3.85	3.94	4.02	4.11	4.19	4.28	4.37
17	3.83	3.92	4.01	4.10	4.18	4.27	4.36	4.46	4.55	4.64
18	4.06	4.15	4.24	4.34	4.43	4.52	4.62	4.72	4.81	4.91
19	4.29	4.38	4.48	4.58	4.68	4.78	4.88	4.98	5.08	5.19
20	4.51	4.61	4.71	4.82	4.92	5.03	5.13	5.24	5.35	5.46
21	4.74	4.84	4.95	5.06	5.17	5.28	5.39	5.50	5.62	5.73
22	4.96	5.07	5.19	5.30	5.41	5.53	5.65	5.77	5.88	6.01
23	5.19	5.30	5.42	5.54	5.66	5.78	5.90	6.03	6.15	6.28
24	5.41	5.53	5.66	5.78	5.91	6.03	6.16	6.29	6.42	6.55
25	5.64	5.76	5.89	6.02	6.15	6.28	6.42	6.55	6.69	6.82
26	5.87	6.00	6.12	6.26	6.40	6.54	6.67	6.81	6.95	7.10
27	6.09	6.23	6.36	6.50	6.64	6.79	6.93	7.08	7.22	7.37
28	6.32	6.46	6.60	6.74	6.89	7.04	7.19	7.34	7.49	7.64
29	6.54	6.69	6.84	6.99	7.14	7.29	7.44	7.60	7.66	7.92
30	6.77	6.92	7.07	7.23	7.38	7.54	7.70	7.86	8.02	8.19
31	6.09	7.15	7.31	7.47	7.63	7.70	7.06	8.12	8.29	8.46

	10	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
.2	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07
.3	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
.4	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13
.5	0.14	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.17
.6	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20
.7	0.19	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.23	0.23
.8	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26
.9	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30
Area.	0.28	0.28	0.29	0.30	0.30	0.31	0.21	0.32	0.32	0.33
2	0.56	0 57	0.58	0.59	0.60	0 61	0.62	0.64	0.65	0.66
3	0.84	0.85	0.87	0.89	0.90	0.92	0 94	0.96	0.97	0.99
4	1.11	1.14	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.32
5	1.39	1 42	1.45	1 48	1.51	1.54	1 56	1.59	1.62	1.65
6	1.67	1.70	1.74	1.77	1.81	1.84	1.88	1.91	1.95	1.99
7	1.95	1.99	2.03	2.07	2.11	2 15	2.19	2.23	2.27	2.32
8	2.23	2.27	2.32	2.36	2.41	2.46	2.50	2.55	2.60	2.65
9	2.51	2.56	2.61	2.66	2.71	2.76	2.82	2.87	2.92	2.98
10	2.78	2.84	2.90	2.95	3.01	3.07	3.13	3 19	3.25	3.31
11	3.06	3.12	3.19	3.25	3.31	3 38	3.44	3 51	3.57	3.64
12	3.34	3 41	3.48	3.55	3 61	3 68	3 75	3.82	3.90	3.97
13	3.62	3.69	3.77	3.84	3.92	3.99	4.07	4.15	4.22	4.30
14	3.90	3.98	4.06	4.14	4.22	4.30	4.38	4.46	4.55	4.63
15	4.18	4.26	4.35	4.43	4 52	4.61	4.69	4.78	4.87	4.95
16	4.46	4.55	4.64	4.73	4.82	4.91	5 01	5.10	5.20	5.29
17	4.73	4.83	4.93	5.02	5.12	5.22	5.32	5.42	5.52	5.62
18	5.01	5.11	5.22	5.32	5.42	5.53	5.63	5.74	5 85	5.96
19	5.29	5.40	5.51	5.61	5.72	5.83	5.94	6.06	6.17	6.29
20	5.57	5.68	5.80	5.91	6.02	6.14	6.26	6.38	6.50	6.62
21	5.85	5.97	6 09	6.21	6.32	6 45	6 57	6.70	6.82	6.95
22	6.13	6.25	6.38	6.50	6.63	6.75	6 88	7.02	7.15	7.28
23	6.41	6.53	6 67	6.80	6.93	7.06	7.20	7.34	7.47	7 61
24	6.68	6 82	6.95	7 09	7.23	7.37	7.51	7.65	7.80	7.94
25	6 96	7.10	7.24	7.39	7.53	7 68	7.82	7.97	8.12	8.27
26	7.24	7.39	7 53	7.68	7.83	7.98	8.14	8 29	8.45	8.60
27	7.52	7.67	7.82	7.98	8 13	8.29	8.45	8.61	8.77	8.93
28	7.80	7.95	8.11	8.27	8.43	8.60	8.76	8.93	9.10	9.26
29	8.08	8 24	8.40	8.57	8.73	8.91	9.07	9.25	9.42	9.60
30	8.35	8.52	8.69	8.86	9.04	9.21	9.39	9.57	9.75	9.93
31	8.63	8.81	8.98	9.16	9.34	9.52	9.70	9.89	10.07	10.26

Cylinders in Ale-Gallons.

	11	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
.2	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08
.3	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.12	0.12
.4	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16
.5	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20
.6	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.24
.7	0.24	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.28
.8	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.32
.9	0.30	0.31	0.31	0.32	0.33	0.33	0.34	0.34	0.35	0.36
Area.	0.34	0.34	0.35	0.36	0.36	0.37	0. 7	0.38	0.39	0.39
2	0.67	0.69	0.70	0.71	0.72	0.74	0.75	0.76	0.78	0.78
3	1.01	1.03	1.05	1.07	1.09	1.10	1.12	1.14	1.16	1.18
4	1.35	1.37	1.40	1.42	1.45	1.47	1.50	1.52	1.55	1.58
5	1.68	1.72	1.75	1.78	1.81	1.84	1.87	1.91	1.94	1.97
6	2.02	2.06	2.10	2.13	2.17	2.21	2.25	2.29	2.33	2.37
7	2.37	2.40	2.45	2.49	2.53	2.58	2.62	2.67	2.71	2.76
8	2.70	2.75	2.79	2.84	2.90	2.95	3.00	3.05	3.10	3.15
9	3.03	3.09	3.14	3.20	3.26	3.31	3.37	3.43	3.49	3.55
10	3.37	3.43	3.49	3.56	3.62	3.68	3.75	3.81	3.88	3.94
11	3.71	3.77	3.84	3.91	3.98	4.05	4.12	4.19	4.27	4.34
12	4.04	4.12	4.19	4.27	4.34	4.42	4.50	4.58	4.65	4.73
13	4.38	4.46	4.54	4.62	4.71	4.79	4.87	4.96	5.04	5.13
14	4.72	4.80	4.89	4.98	5.07	5.16	5.25	5.34	5.43	5.52
15	5.05	5.15	5.24	5.33	5.43	5.52	5.62	5.72	5.82	5.92
16	5.39	5.49	5.59	5.69	5.79	5.89	6.00	6.10	6.20	6.31
17	5.73	5.83	5.94	6.04	6.15	6.26	6.37	6.48	6.59	6.70
18	6.07	6.18	6.29	6.40	6.52	6.63	6.75	6.86	6.98	7.09
19	6.40	6.52	6.64	6.76	6.88	7.00	7.12	7.24	7.37	7.49
20	6.74	6.86	6.99	7.11	7.24	7.37	7.50	7.63	7.76	7.89
21	7.18	7.21	7.34	7.17	7.60	7.73	7.87	8.01	8.14	8.28
22	7.41	7.55	7.69	7.82	7.96	8.10	8.25	8.39	8.59	8.68
23	7.75	7.89	8.04	8.18	8.33	8.47	8.62	8.77	8.92	9.07
24	8.09	8.24	8.39	8.53	8.69	8.84	8.99	9.15	9.37	9.47
25	8.42	8.58	8.73	8.89	9.05	9.21	9.37	9.53	9.69	9.86
26	8.76	8.92	9.08	9.25	9.41	9.58	9.74	9.91	10.08	10.25
27	9.10	9.27	9.43	9.60	9.77	9.94	10.12	10.29	10.47	10.65
28	9.44	9.61	9.78	9.96	10.14	10.31	10.49	10.68	10.96	11.04
29	9.77	9.95	10.13	10.31	10.50	10.68	10.87	11.06	11.25	11.44
30	10.11	10.30	10.48	10.67	10.86	11.05	11.24	11.44	11.63	11.83
31	10.45	10.64	10.83	11.02	11.22	11.42	11.62	11.82	12.02	12.23

	12	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05
.2	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
.3	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.14
.4	0.16	0.16	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.19
.5	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23
.6	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28
.7	0.28	0.29	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32
.8	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37
.9	0.36	0.37	0.37	0.38	0.38	0.39	0.40	0.40	0.41	0.42
Area.	0.40	0.41	0.41	0.42	0.43	0.44	0.44	0.45	0.46	0.46
2	0.80	0.82	0.83	0.84	0.86	0.87	0.88	0.90	0.91	0.93
3	1.20	1.22	1.24	1.26	1.28	1.31	1.33	1.35	1.37	1.39
4	1.60	1.63	1.66	1.69	1.71	1.74	1.77	1.80	1.83	1.85
5	2.01	2.04	2.07	2.11	2.14	2.18	2.21	2.25	2.28	2.32
6	2.41	2.45	2.49	2.53	2.57	2.61	2.65	2.70	2.74	2.78
7	2.81	2.85	2.90	2.95	3.00	3.05	3.10	3.14	3.19	3.24
8	3.21	3.26	3.32	3.37	3.43	3.48	3.54	3.59	3.65	3.71
9	3.61	3.67	3.73	3.79	3.85	3.92	3.98	4.04	4.11	4.17
10	4.01	4.08	4.14	4.21	4.28	4.35	4.42	4.49	4.56	4.63
11	4.41	4.49	4.56	4.64	4.71	4.79	4.86	4.94	5.02	5.10
12	4.81	4.89	4.97	5.09	5.14	5.22	5.31	5.39	5.48	5.56
13	5.21	5.30	5.39	5.48	5.57	5.66	5.75	5.84	5.93	6.03
14	5.62	5.71	5.80	5.90	5.99	6.09	6.19	6.29	6.39	6.49
15	6.02	6.12	6.22	6.32	6.42	6.53	6.63	6.74	6.84	6.95
16	6.42	6.52	6.63	6.74	6.85	6.96	7.08	7.19	7.30	7.42
17	6.82	6.93	7.05	7.16	7.28	7.40	7.52	7.64	7.76	7.88
18	7.22	7.34	7.46	7.59	7.71	7.83	7.96	8.09	8.21	8.34
19	7.62	7.75	7.88	8.01	8.14	8.27	8.40	8.53	9.67	8.81
20	8.02	8.16	8.29	8.43	8.56	8.70	8.84	8.98	9.13	9.27
21	8.42	8.56	8.70	8.85	8.99	9.14	9.29	9.12	9.58	9.73
22	8.82	8.97	9.12	9.27	9.42	9.57	9.73	9.88	10.04	10.20
23	9.23	9.38	9.53	9.69	9.85	10.01	10.17	10.33	10.49	10.66
24	9.63	9.79	9.95	10.11	10.28	10.44	10.61	10.78	10.95	11.12
25	10.03	10.19	10.36	10.54	10.70	10.88	11.05	11.23	11.41	11.59
26	10.43	10.60	10.78	10.96	11.13	11.32	11.50	11.68	11.86	12.05
27	10.83	11.01	11.19	11.38	11.56	11.75	11.94	12.13	12.32	12.51
28	11.23	11.42	11.61	11.80	11.99	12.19	12.38	12.58	12.78	12.98
29	11.63	11.83	12.02	12.22	12.42	12.62	12.82	13.03	13.23	13.44
30	12.03	12.23	12.43	12.64	12.85	13.06	13.27	13.48	13.99	13.90
31	12.43	12.64	12.85	13.06	13.27	13.49	13.71	13.93	14.15	14.37

Cylinders in Ale-Gallons.

	13	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
.2	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11
.3	0.14	0.15	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16
.4	0.19	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0,22
.5	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.27	0.27
.6	0.28	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.32
.7	0.33	0.33	0.34	0.34	0.34	0.36	0.36	0.37	0.37	0.38
.8	0.38	0.38	0.39	0.39	0.39	0.41	0.41	0.42	0.42	0.43
.9	0.42	0.43	0.44	0.44	0.44	0.46	0.46	0.47	0.48	0.48
Area.	0.47	0.48	0.19	0.49	0.50	0.51	0.51	0.52	0.53	0.54
2	0.94	0.96	0.97	0.99	0.99	1.02	1.03	1.05	1.06	1.08
3	1.41	1.43	1.46	1.48	1.50	1.52	1.55	1.57	1.59	1.61
4	1.88	1.91	1.94	1.97	2.00	2.03	2.06	2.09	2.12	2.15
5	2.32	2.39	2.43	2.46	2.50	2.54	2.58	2.61	2.65	2.69
6	2.82	2.87	2.91	2.96	3.00	3.05	3.09	3.14	3.18	3.23
7	3.29	3.35	3.40	3.45	3.50	3.55	3.61	3.66	3.71	3.77
8	3.75	3.82	3.88	3.94	4.00	4.06	4.12	4.18	4.24	4.30
9	4.21	4.30	4.37	4.44	4.50	4.57	4.64	4.70	4.77	4.84
10	4.71	4.78	4.85	4.93	5.00	5.08	5.15	5.23	5.30	5.38
11	5.18	5.26	5.34	5.42	5.50	5.56	5.67	5.75	5.83	5.92
12	5.65	5.74	5.83	5.91	6.00	6.09	6.18	6.27	6.36	6.46
13	6.12	6.21	6.31	6.41	6.50	6.60	6.70	6.79	6.90	7.00
14	6.59	6.69	6.79	6.90	7.00	7.11	7.21	7.32	7.43	7.53
15	7.05	7.17	7.28	7.39	7.50	7.61	7.73	7.84	7.96	8.07
16	7.53	7.65	7.76	7.89	8.00	8.12	8.24	8.36	8.19	8.61
17	8.00	8.13	8.25	8.38	8.50	8.63	8.76	8.89	9.02	9.15
18	8.47	8.60	8.74	8.87	9.00	9.14	9.26	9.41	9.55	9.69
19	8.94	9.08	9.22	9.36	9.50	9.64	9.79	9.93	10.08	10.22
20	9.41	9.56	9.71	5.86	10.00	10.15	10.30	10.45	10.61	10.76
21	9.88	10.04	10.19	10.35	10.50	10.66	10.82	10.98	11.14	11.30
22	10.36	10.52	10.68	10.84	11.00	11.17	11.33	11.50	11.67	11.84
23	10.83	10.99	11.16	11.34	11.50	11.67	11.85	12.02	12.20	12.38
24	11.30	11.47	11.65	11.83	12.00	12.18	12.39	12.54	12.73	12.91
25	11.77	11.95	12.13	12.32	12.50	12.69	12.88	13.07	13.26	13.45
26	12.24	11.43	12.62	12.82	13.00	13.20	13.39	13.59	13.79	13.99
27	12.71	12.91	13.10	13.31	13.50	13.71	13.91	14.11	14.32	14.53
28	13.18	13.38	13.59	13.80	14.00	14.21	14.42	14.64	14.85	15.07
29	13.65	13.86	14.07	14.29	14.50	14.72	14.94	15.16	15.38	15.60
30	14.12	14.34	14.56	14.79	15.00	15.23	15.45	15.68	15.91	16.14
31	14.59	14.82	15.04	15.28	15.50	15.74	15.97	16.20	16.44	16.68

	14	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.00	0.05	0.06
.2	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
.3	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.19
.4	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.25
.5	0.27	0.28	0.28	0.28	0.29	0.20	0.30	0.30	0.30	0.31
.6	0.33	0.33	0.34	0.34	0.35	0.35	0.30	0.30	0.30	0.37
.7	0.38	0.39	0.39	0.40	0.41	0.41	0.42	0.42	0.42	0.43
.8	0.44	0.44	0.45	0.46	0.47	0.47	0.47	0.47	0.47	0.49
.9	0.49	0.50	0.51	0.51	0.52	0.52	0.52	0.52	0.54	0.56
Area.	0.54	0.55	0.56	0.57	0.58	0.59	0.50	0.60	0.61	0.62
2	1.09	1.11	1.12	1.14	1.15	1.17	1.19	1.20	1.22	1.24
3	1.64	1.56	1.68	1.71	1.73	1.76	1.78	1.80	1.83	1.85
4	2.18	2.21	2.25	2.28	2.31	2.34	2.37	2.41	2.44	2.47
5	2.73	2.77	2.81	2.85	2.89	2.93	2.97	3.01	3.05	3.09
6	3.27	2.32	3.37	2.42	3.50	3.51	2.56	2.61	2.56	2.71
7	3.82	3.88	3.93	3.99	4.04	4.10	4.15	4.22	4.27	4.33
8	4.37	4.43	4.49	4.56	4.62	4.68	4.75	4.81	4.88	4.94
9	4.91	4.98	5.05	5.13	5.20	5.27	5.34	5.42	5.49	5.56
10	5.46	5.54	5.62	5.70	5.77	5.86	5.94	6.02	6.10	6.18
11	6.00	6.09	6.18	6.26	6.35	6.44	6.52	6.62	6.71	6.80
12	6.55	6.64	6.74	6.83	6.93	7.03	7.12	7.22	7.32	7.42
13	7.10	7.20	7.30	7.40	7.51	7.61	7.72	7.82	7.93	8.04
14	7.64	7.25	7.86	7.97	8.08	8.20	8.31	8.13	8.54	8.65
15	8.19	8.31	8.42	8.54	8.66	8.78	8.90	9.03	9.10	9.27
16	8.72	8.86	8.98	9.11	9.24	9.37	9.50	9.62	9.71	9.89
17	9.28	9.41	9.55	9.08	9.82	9.95	10.09	10.23	10.37	10.51
18	9.83	9.97	10.11	10.25	10.39	10.54	10.69	10.83	10.98	11.13
19	10.27	10.52	10.57	10.82	10.70	11.13	11.28	14.43	11.49	11.74
20	10.91	11.07	11.23	11.39	11.28	11.71	11.87	12.04	12.20	12.36
21	11.45	11.62	11.79	11.96	12.85	12.20	12.43	12.64	12.81	12.08
22	2.01	12.18	12.35	12.53	12.70	12.88	13.05	13.24	13.42	13.60
23	12.55	12.73	12.92	13.19	13.28	13.47	13.66	13.83	14.03	14.22
24	13.10	13.29	13.48	13.36	13.86	14.05	14.25	14.43	14.64	14.83
25	13.65	13.84	14.01	14.42	14.44	14.64	14.84	15.04	15.25	15.45
26	14.19	14.40	14.60	14.48	15.01	15.22	15.45	15.64	15.86	16.07
27	14.74	14.95	15.16	15.38	15.59	15.81	16.03	16.27	16.47	16.69
28	15.28	15.50	15.72	15.95	16.17	16.40	16.63	16.86	17.08	17.31
29	15.83	15.06	16.29	16.52	16.75	16.98	17.22	17.46	17.69	17.92
30	16.38	16.61	16.85	17.08	17.32	17.55	17.81	18.06	18.30	18.54
31	16.92	16.16	17.41	17.65	17.90	18.15	18.41	18.67	18.91	19.16

Cylinders in Ale-Gallons.

	15	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
.2	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14
.3	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.21	0.21	0.21
.4	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.28
.5	0.31	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.35	0.35
.6	0.38	0.38	0.39	0.39	0.40	0.40	0.40	0.41	0.42	0.42
.7	0.43	0.44	0.45	0.46	0.46	0.47	0.47	0.48	0.49	0.49
.8	0.50	0.51	0.51	0.52	0.53	0.53	0.53	0.55	0.56	0.56
.9	0.56	0.57	0.58	0.50	0.59	0.60	0.60	0.62	0.63	0.73
Area.	0.63	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71
2	1.25	1.27	1.29	1.30	1.32	1.34	1.36	1.37	1.39	1.41
3	1.88	1.90	1.93	1.96	1.98	2.01	2.03	2.06	2.09	2.11
4	2.51	2.54	2.57	2.61	2.64	2.68	2.71	2.75	2.78	2.82
5	3.13	3.17	3.22	3.26	3.30	3.35	3.39	3.53	3.48	3.52
6	3.76	3.81	3.86	3.01	3.96	4.01	4.07	4.12	4.17	4.22
7	4.39	4.44	4.50	4.56	4.62	4.68	4.74	4.81	4.87	4.93
8	5.01	5.08	5.15	5.22	5.28	5.35	5.42	5.49	5.56	5.63
9	5.64	5.71	5.79	5.87	5.94	6.02	6.10	6.18	6.26	6.34
10	6.27	6.35	6.43	6.52	6.60	6.69	6.79	6.85	6.95	7.04
11	6.89	6.98	7.08	7.17	7.27	7.30	7.46	7.55	7.65	7.74
12	7.52	7.62	7.72	7.82	7.93	8.03	8.13	8.24	8.34	8.45
13	8.15	8.25	8.37	8.48	8.59	8.70	8.82	8.92	9.04	9.15
14	8.77	8.89	9.01	9.13	9.25	9.37	9.49	9.61	9.73	9.85
15	9.40	9.52	9.65	9.78	9.91	10.04	10.17	10.30	10.43	10.56
16	10.03	10.16	10.30	10.43	10.57	10.71	10.84	10.98	11.12	11.27
17	10.65	10.79	10.94	11.08	11.23	11.37	11.52	11.67	11.82	11.97
18	11.28	11.43	11.58	11.74	11.89	12.04	12.20	12.36	12.52	12.67
19	11.91	12.05	12.23	12.39	12.55	12.71	12.88	13.04	[illegible]	13.38
20	12.53	12.70	12.87	13.04	13.21	13.38	13.56	13.73	13.91	14.08
21	13.16	13.33	13.51	13.69	13.87	14.05	14.23	14.42	14.60	14.79
22	13.78	13.97	14.16	14.34	14.53	14.72	14.91	15.10	15.30	15.49
23	14.41	14.60	14.80	15.00	15.19	15.39	15.59	15.79	15.99	16.19
24	15.04	15.24	15.44	15.65	15.85	16.05	16.27	16.48	16.69	16.90
25	15.66	15.87	16.09	16.30	16.51	16.73	16.94	17.16	17.38	17.60
26	16.29	16.51	16.73	16.95	17.17	17.40	17.62	17.85	18.08	18.31
27	16.92	17.14	17.37	17.60	17.83	18.07	18.30	18.54	18.77	19.01
28	17.54	17.78	18.02	18.26	18.50	18.73	18.98	19.22	19.47	19.71
29	18.17	18.41	18.66	18.91	19.15	19.40	19.66	19.91	20.16	20.42
30	18.80	19.05	19.30	19.56	19.81	20.07	20.33	20.59	20.86	21.12
31	19.42	19.68	19.95	20.21	20.48	20.74	21.01	21.28	21.55	21.83

	16	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08
.2	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0 16
.3	0.21	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0 24	0.24
.4	0.29	0.29	0.29	0.20	0.30	0.30	0.31	0.31	0.31	0.32
.5	0.36	0.26	0.37	0.37	0 37	0.38	0.28	0.39	0.39	0.40
.6	0.43	0.43	0.44	0.44	0.45	0.45	0.46	0 47	0.47	0.48
.7	0.50	0.50	0.51	0.52	0.52	0.53	0.55	0.54	0 55	0.56
.8	0.57	0.58	0.58	0.59	0.60	0.61	0.61	0.63	0.63	0.64
.9	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71	0.72
Area.	0.71	0.72	0.73	0.74	0.75	0 76	0.77	0.78	0.79	0.80
2	1.43	1.44	1.46	1.48	1.50	1.52	1.53	1.55	1.57	1.59
3	2.15	2.17	2.16	2.22	2.25	2.27	2.30	2.33	2.36	2.39
4	2.85	2.89	2.92	2.96	3.00	3.03	3.07	3.11	3.14	3.18
5	3.56	3.77	3.65	3.78	3.75	3.79	3.84	3.88	3.93	3.98
6	4.28	4.12	4.39	4.44	4.49	4.55	4.60	4.66	4.72	4.77
7	4.99	5.05	5.12	5.18	5.24	5.31	5.37	5.44	5.50	5.57
8	5.70	5.77	5.85	5.94	5 99	6.07	6.14	6.21	6.29	6.36
9	6.42	6.50	6.58	6.66	6.74	6.82	6.91	6.99	7.07	7.16
10	7.13	7.22	7.31	7.40	7.49	7.58	7.67	7.77	7.86	7.95
11	7.84	7.94	8.04	8.14	8.24	8.34	8 44	8.54	8.65	8.75
12	8.56	8.66	8.77	8.88	8.99	9.10	9.21	9.32	9.43	9.55
13	9.27	9.38	9.50	9.62	9.77	9.86	9.98	10.10	10.22	10.34
14	9 98	10.11	10.23	10.36	10.49	10.61	10.74	10.87	10.98	11.14
15	10.69	10.83	10.96	11.10	11.24	11.37	11.51	11.65	11.79	11.93
16	11.41	11.55	11.69	11.84	11 99	12.13	12.28	12 43	12.58	12.73
17	12.12	12.27	12.43	12.58	12.73	12.89	13.05	13.20	13.36	13.52
18	12.83	12.99	13.16	13.32	13.48	13.65	13.81	13.98	14.15	14.32
19	13.55	13.72	13.89	14.06	14.23	14.41	14.58	14.76	14.94	15.11
20	14.26	14.44	14.62	14.80	14.90	15.16	15.35	15 53	15.72	15.91
21	14.97	15.16	15.35	15.54	15.63	15 92	16.12	16.21	16 51	16.71
22	15.69	15.88	16.08	16.28	16.48	16.68	16.88	17.09	17.29	17.50
23	16.40	16.60	16.80	17.02	17.23	17.44	17.65	17.86	18 08	18.30
24	17.11	17.33	17.54	17.76	17.98	18.20	18.42	18 64	18.87	19.09
25	17.82	18.05	18.27	18.50	18.73	18.95	19.19	19 42	19 65	19.89
26	18.54	18.77	19.00	19.24	19.48	19.71	19.95	20.19	20.44	20.68
27	19.25	19.49	19.73	19.98	20.23	20.47	20.72	20.97	21.22	21.48
28	19.96	20.21	20.46	20.72	20.97	21.23	21.49	21.75	22.01	22.27
29	20.68	20.93	21.20	21.46	21.72	21.99	22.26	22.52	22.80	23.07
30	21.39	21.66	21.93	22.21	22.47	22.75	23.02	23.30	23.58	23.85
31	22.10	22.38	22.66	22.94	23.22	23.50	23.79	24.08	24 37	24.66

	17	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.08	0.08	0.00	0.08	0.08	0.09	0.09	0.09	0.09	0.09
.2	0.16	0.16	0.16	0.17	0.17	0.17	0.12	0.17	0.18	0.18
.3	0.24	0.24	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.27
.4	0.32	0.33	0.33	0.33	0.33	0.34	0.34	0.35	0.35	0.36
.5	0.40	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.45
.6	0.48	0.49	0.49	0.50	0.51	0.51	0.52	0.52	0.53	0.54
.7	0.56	0 57	0.58	0.56	0.59	0.60	0.60	0.91	0.52	0.62
.8	0.64	0.65	0.66	0.67	0.67	0.68	0.69	0.70	0.71	0.71
.9	0.72	0.73	0.74	0.65	0.76	0.77	0.78	0.78	0.79	0.80
Area.	0.80	0.81	0.82	0 83	0.84	0.85	0 86	0.87	0.88	0.89
2	1.61	1.63	1.65	1.67	1.69	1.71	1.73	1.74	1.76	1.78
3	2.41	2.44	2.47	2.50	2.53	2.56	2.59	2.62	2.65	2.68
4	3.22	3.26	3.30	3.33	3.37	3.41	3.45	3.49	3.53	3.57
5	4.05	4.07	4.12	4.17	4.21	4.26	4.31	4.36	4.41	4.46
6	4.85	4 89	4.94	5.00	5.05	5.12	5.18	5.23	5.29	5.35
7	5.63	5.70	5.77	5.83	5.90	5.97	6.04	6.11	6.18	6.25
8	6 44	6 51	6.59	6.67	6.75	6.82	6.99	6.98	7.06	7.14
9	7.24	7.33	7 41	7 56	7.59	7.68	7.76	7.85	7.94	8.03
10	8.05	8.14	8.24	8.34	8.43	8.53	8.63	8.72	8.82	8.92
11	8.85	8.96	9 06	9 17	9.27	9.38	9 49	9.60	9.71	9.82
12	9.66	9.77	9.89	10.00	10.12	10.23	10.35	10.47	10.59	10.71
13	10.46	10.59	10.71	10.84	10.96	11.09	11.21	11.34	11 47	11.60
14	11.27	11.40	11.53	11.65	11.80	11 94	12.08	12.21	12 35	12.49
15	12.07	12.22	12.36	12.50	12.65	12.76	12.94	13.09	13.24	13.39
16	12.88	13.03	13.18	13 34	13.49	13.65	13.80	13.96	14.12	14.28
17	13.68	13.84	14.01	14 17	14.33	14.50	14.67	14.83	15.00	15.17
18	14.49	14 65	14.83	15.00	15.18	15.35	15.53	15.70	15.88	16.06
19	15 29	15.47	15.65	15.84	15.99	16.20	16.39	16.58	16.77	16.96
20	16.10	16.29	16.48	16.67	16.86	17.06	17.25	17.45	17.65	17.85
21	16.90	17.10	17.30	17.51	17.71	17.91	18.12	18.32	18.54	18.74
22	17.71	17.92	18.13	18.34	18.55	18.76	18.98	19.19	19.41	19.63
23	18 51	18.73	18.95	19.17	19.39	19.62	19.84	20.07	20.29	20.52
24	19.32	19 55	19.77	20.01	20.24	20.47	20.70	20.94	21.18	21.42
25	20.12	20.35	20.60	20.84	21.08	21.32	21.57	21.81	22.06	22.31
26	20.93	21.17	21.42	21.67	21.92	22.18	22.43	22.68	23 01	23.20
27	21.73	21.99	22.25	22.51	22.77	23.03	23.29	23.56	23.82	24.09
28	22.44	22.80	23.07	23.34	23.61	23.88	24 16	24.43	24.71	24 99
29	23.34	23 62	23.89	24.17	24.45	24.73	25.02	25 30	25.59	25.88
30	24 15	24.43	24.72	25 01	25.30	25.59	25.88	26.17	26.47	26.77
31	2495	25.25	25 54	25.44	26.16	26.44	26.74	27.05	27.35	27.66

	18	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
.2	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.20	0.20
.3	0.27	0.27	0.28	0.28	0.28	0.29	0.29	0.29	0.30	0.30
.4	0.36	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.39	0.40
.5	0.45	0.46	0.46	0.47	0.47	0.48	0.48	0.49	0.49	0.50
.6	0.54	0.55	0.55	0.56	0.57	0.57	0.58	0.58	0.59	0.60
.7	0.63	0.64	0.65	0.65	0.66	0.67	0.67	0.68	0.69	0.70
.8	0.72	0.73	0.74	0.75	0.75	0.76	0.77	0.78	0.79	0.80
.9	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90
Area.	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.90
2	1.80	1.82	1.84	1.87	1.89	1.91	1.93	1.95	1.97	1.99
3	2.71	2.74	2.77	2.80	2.83	2.86	2.89	2.92	2.95	2.98
4	3.61	3.64	3.69	3.73	3.77	3.81	3.85	3.90	3.94	3.98
5	4.51	4.56	4.61	4.66	4.71	4.77	4.82	4.87	4.92	4.97
6	5.41	5.47	5.53	5.60	5.66	5.72	5.78	5.84	5.91	5.97
7	6.32	6.59	6.46	6.53	6.60	6.20	6.74	6.84	6.89	6.89
8	7.22	7.30	7.38	7.46	7.54	7.16	7.71	7.79	7.88	7.88
9	8.12	8.21	8.30	8.39	8.49	8.11	8.67	8.76	8.86	8.86
10	9.02	9.12	9.22	9.33	9.43	9.53	9.63	9.74	9.84	9.84
11	9.93	10.04	10.15	10.26	10.37	10.49	10.60	10.71	10.83	10.83
12	10.83	10.95	11.07	11.19	11.31	11.44	11.56	11.6	11.11	11.94
13	11.73	11.85	11.99	12.12	12.26	12.39	12.53	12.66	12.80	12.93
14	12.63	12.77	12.91	13.06	13.20	13.34	13.49	13.63	13.78	13.93
15	13.54	13.25	13.84	13.99	14.14	14.30	14.45	14.61	14.77	14.92
16	14.44	14.16	14.76	14.02	15.16	15.25	15.42	15.58	15.75	15.92
17	15.34	15.51	15.68	15.86	16.03	16.20	16.38	16.56	16.73	16.91
18	16.24	16.42	16.60	16.79	16.97	17.16	17.34	17.53	17.72	17.91
19	17.15	17.34	17.53	17.72	17.91	18.11	18.31	18.50	18.70	18.90
20	18.05	18.25	18.45	18.65	18.86	19.06	19.27	19.48	19.69	19.90
21	18.95	19.16	19.27	19.59	19.80	20.02	20.23	20.45	20.67	20.89
22	19.85	20.07	20.29	20.52	20.74	20.97	21.20	21.42	21.66	21.65
23	20.76	20.99	21.22	21.45	21.69	21.92	22.16	22.40	22.64	22.64
24	21.66	21.90	22.14	22.38	22.63	22.88	23.12	23.37	23.63	23.63
25	22.56	22.81	23.06	23.32	23.57	23.83	24.11	24.35	24.61	24.87
26	23.46	23.72	23.98	24.25	24.52	24.78	25.05	25.32	25.59	25.87
27	24.36	24.63	24.91	25.18	25.46	25.74	25.01	26.30	26.58	26.85
28	25.27	25.55	25.83	26.12	26.40	26.69	27.98	27.27	27.56	27.86
29	26.17	26.46	26.75	27.05	27.34	27.64	27.94	28.24	28.55	28.85
30	27.07	27.37	27.67	27.98	28.29	28.60	28.90	29.22	29.53	29.85
31	27.97	28.28	28.60	28.91	29.23	29.55	29.87	30.19	30.52	30.84

	19	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0 11	0.11	0 11
.2	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22
.3	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.33	0.33
4	0.40	0.41	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44
.5	0.50	0.51	0.51	0.52	0.52	0.53	0.53	0.54	0.55	0 55
.6	0.60	0.61	0.62	0.62	0.63	0.64	0.64	0.65	0.65	0.66
.7	0.70	0.71	0.72	0.73	0.73	0.74	0.75	0.76	0.76	0.77
.8	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0 86	0.87	0 88
.9	0.90	0.95	0.92	0.93	0.94	0.95	0.96	0.97	0 98	0.99
Area.	1 00	1.02	1.03	1.04	1.05	1 05	1.07	1.08	1.09	1.10
2	2.01	2.03	2.05	2.08	2.10	2.12	2.14	2.16	2.18	2.21
3	3.02	3 05	3.08	3.11	3.14	3.18	3.21	3 24	3.28	3.31
4	4.02	4.06	4.11	4.15	4.19	4.14	4.28	4.32	4.37	4.41
5	5.03	5.08	5.13	5.21	5 24	5.29	5.35	5.40	5.46	5.51
6	6.03	6.10	6.16	6.23	6.29	6.35	6.42	6.49	6.55	6 62
7	7.04	7.11	7.19	7.26	7.34	7.41	7.49	7.57	7 64	7.72
8	8.04	8.13	8.21	8.30	8.39	8.47	8.56	8 65	8.74	8.82
9	9.05	9.14	9.24	9.34	9.43	9.53	9.63	9.73	9.83	9.93
10	10.05	10.16	10 27	10.38	10.48	10.59	10.70	10.81	10.92	11.03
11	11.06	11.18	11.29	11.41	11.53	11.65	11.77	11.89	12.01	12.13
12	12.06	12.19	12.32	12 45	12.58	12.71	12.84	12.97	13.10	13.23
13	13.07	13.21	13 35	13.49	13.63	13 77	13.91	14.05	14.19	14.34
14	14.08	14.22	14 37	14.53	14 67	14.83	14.98	15.13	15.29	15.44
15	15.08	15.24	15 40	15.57	15.72	15.88	16 05	16.21	16.38	16.54
16	16.09	16.26	16.43	16 60	16 77	16 94	17.12	17.29	17.47	17.65
17	17.09	17.27	17.45	17.64	17.82	18.00	18.19	18.38	18.56	12.75
18	18.10	18.29	18.48	18 68	18.87	19.06	19.26	19.46	19.65	13.85
19	19.10	19.30	19.51	19.72	19.92	20.12	20.33	20.54	20.75	20.95
20	20.11	20.32	20.53	20.75	20.96	21.18	21 40	21.62	21.84	22.05
21	21.11	21.34	21.55	21 79	22.01	22.24	22.47	22.70	22.93	23.16
22	22.12	22.35	22.59	22.83	23 06	23.30	23.54	23.78	24.02	24 26
23	23.12	23.37	23.61	23.87	24.11	24.36	24.61	24.86	25.11	25 37
24	24.13	24.38	24.64	24.90	25.16	25.42	25.68	25.94	26.21	26.47
25	25 13	25.40	25.67	25.94	26.20	26.47	26 75	27.02	27.30	27.57
26	26.14	26.42	26 69	26.98	27.25	27.53	27.82	28 10	28.39	28.68
27	27.15	27.43	27.72	28.02	28.30	28.59	28.89	29.18	29.48	29.78
28	28.15	28.45	28.75	29 06	29.35	29.65	29.96	30.27	30.57	30.88
29	29.16	29.46	29.77	30.03	30.40	30.71	31.03	31.35	31.66	31.98
30	30.16	30.48	30.80	31.13	31.45	31.77	32.10	32.43	32.76	33.09
31	31.17	31.50	31.83	32.17	32 49	32.83	33.17	33.51	33 85	34.19

	20	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.11	0.11	0.11	0.11	0.11	0.11	0. 2	0.12	0.12	0.12
.2	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24
.3	0.33	0.34	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.36
.4	0.45	0.45	0.45	0.46	0.46	0.47	0.47	0.48	0.48	0.49
.5	0.56	0.56	0.57	0.57	.58	0.58	0.59	0.60	0.60	0.61
.6	0.67	0.67	0.68	0.69	0.70	0.70	0.71	0.72	0.72	0.73
.7	0.78	0.79	0.80	0.80	0.81	0.82	0.83	0.84	0.84	0.85
.8	0.89	0.90	0.91	0.92	0 93	0.94	0.95	0.95	0.96	0.97
.9	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09
Area.	1.11	1.12	1. 4	1. [illegible]	1. 6	1.17	1.18	1.10	1.20	1.22
2	2.23	2.25	2.27	2.30	2.33	2.34	2.36	2.39	2.41	2.43
3	3.34	3.38	3.41	3.46	3.48	3.51	3.55	3.58	3.61	3.65
4	4.45	4.50	4.54	4.59	4.64	4. 8	4.73	4.77	4.82	4.87
5	5.57	5.63	5.68	5.74	5.79	5.85	5.91	5.97	6.02	6.08
6	6.68	6.75	6.82	6.89	6.95	7.02	7.09	7.16	7.23	7.30
7	7.80	7.88	7.95	8.03	8.11	8. 0	8.27	8.35	8.43	8.52
8	8.91	9.00	9.09	9.18	9.27	9.36	9.45	9.55	9.64	9.73
9	0 03	10.13	0.23	10.33	10.43	10.53	10.64	10.74	10.84	10.90
10	11.14	11.25	11.36	11.48	11.59	11.70	11.82	11.93	12.05	12.17
11	12.25	12.38	12.50	12.62	12.75	12.87	13.00	13.13	13.25	13.38
12	13.37	13.50	13.63	13.77	13.91	14.04	14.18	14.32	14.46	14.60
13	14.48	14.63	14.77	14.92	15.07	15.21	15. 6	15.51	15.66	15.81
14	15.60	15.75	15.91	16.08	16.23	16.39	16.55	16.71	16.87	17.03
15	16.71	16.88	17.04	17.22	17.38	17.56	17.73	7.90	18.07	18.25
16	17.82	17 00	18.18	18.36	18.54	18.73	18.91	19.09	19.28	19.46
17	18.94	19.13	19.32	19.51	19.70	0.90	20.09	20.26	20.48	20.68
18	20.05	20.25	20.45	20.66	20.86	21.07	21.27	21.48	21.69	21.90
19	21.17	21.38	21.59	21.81	22.02	22.24	22.46	22.67	22.89	23.11
20	22.28	22.50	22.73	22.95	2 .18	23.41	3.64	23.87	24.10	24.33
21	23.39	23.63	23.86	24.10	24.34	2 . 8	24 2	25.05	25.30	25.55
22	24.51	24.75	25.00	25.25	25.50	25.75	26.00	26.25	26.51	26.75
23	25.62	25.88	26.13	26.40	26.66	26.92	27.18	27.35	7.71	27.98
24	26.74	27.00	27.27	27.54	27.82	28.09	28.37	28.64	28.92	29.20
25	27.55	28.13	28.41	28.69	28.97	29.26	9.55	29.83	30.12	30.41
26	28.96	29.26	29.54	29.84	30.13	30.13	.0.73	31.03	31.33	21.63
27	30.08	3 .38	30.68	30.99	31.29	3 .60	31.91	32.22	32.53	32.85
28	3 .19	31.51	31.82	32.13	32.45	32.77	3.09	33.42	33.74	34.05
29	32.31	32.63	32.95	33.28	33.61	33.94	34.27	34.61	34.94	35.28
30	33.42	33.76	34.09	34.43	34.77	35.11	35.46	35.80	36.15	36.50
31	34.53	34.88	35.23	35.58	35.93	36.28	36.64	37.00	37.35	37.71

	21	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13
.2	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.27
.3	0.37	0.37	0.38	0.38	0.36	0.39	0.39	0.39	0.40	0.40
.4	0.49	0.50	0.50	0.50	0.51	0.51	0.52	0.52	0.53	0.53
.5	0.61	0.62	0.63	0.63	0.64	0.64	0.65	0.66	0.66	0.67
.6	0.74	0.74	0.75	0.76	0.77	0.77	0.78	0.79	0.79	0.80
.7	0.86	0.87	0.88	0.88	0.85	0.90	0.91	0.92	0.93	0.93
.8	0.98	0.99	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07
.9	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20
Area.	1.23	1.24	1.25	1.26	1.27	1.29	1.30	1.31	1.32	1.34
2	2.46	2.48	2.50	2.53	2.55	2.57	2.60	2.62	2.65	2.67
3	3.68	3.72	3.75	3.78	3.83	3.86	3.90	3.93	3.97	4.01
4	4.91	4.96	5.01	5.04	5.10	5.15	5.20	5.25	5.30	5.34
5	6.14	6.20	6.26	6.31	6.38	6.47	6.50	6.56	6.62	6.68
6	7.37	7.44	7.51	7.57	7.65	7.72	7.80	7.87	7.94	8.01
7	8.60	8.68	8.76	8.83	8.93	9.01	9.09	9.18	9.26	9.35
8	9.82	9.92	10.01	10.09	10.19	10.30	10.39	10.49	10.59	10.69
9	11.05	11.16	11.26	11.36	11.48	11.59	11.69	11.80	11.91	12.0
10	12.28	12.40	12.52	12.63	12.75	12.87	12.99	13.11	13.24	13.36
11	13.51	13.64	13.77	13.89	14.03	14.16	14.29	14.43	14.56	14.69
12	14.74	14.88	15.02	15.15	15.31	15.45	15.59	15.74	15.88	16.03
13	15.97	16.12	16.27	16.42	16.58	16.74	16.89	17.05	17.21	17.37
14	17.19	17.36	17.52	17.68	17.86	18.02	18.21	18.36	18.53	18.70
15	18.42	18.60	18.70	18.94	19.13	19.31	19.49	19.67	19.85	20.04
16	19.65	19.84	20.03	20.21	20.41	20.60	20.79	20.98	21.18	21.37
17	20.88	21.08	21.28	21.47	21.68	21.89	22.09	22.29	22.50	22.71
18	22.11	22.32	22.53	22.73	22.96	23.17	23.39	23.60	23.82	24.04
19	23.33	23.56	23.78	24.00	24.23	24.46	24.69	24.92	25.15	25.38
20	24.56	24.80	25.03	25.26	25.51	25.75	25.99	26.23	26.47	26.72
21	25.79	25.99	26.28	26.52	26.78	27.04	27.29	27.54	27.79	28.05
22	27.02	27.28	27.54	27.79	28.06	28.32	28.59	28.85	29.12	29.39
23	28.25	28.52	28.79	29.05	29.34	29.61	29.89	30.16	30.44	30.72
24	29.48	29.76	30.04	30.32	30.61	30.90	31.18	31.47	31.77	32.06
25	30.70	31.00	31.29	31.58	31.89	32.18	32.48	32.79	33.09	33.40
26	31.93	32.24	32.54	32.84	33.16	33.47	33.78	34.10	34.41	34.73
27	33.16	33.48	33.79	34.11	34.44	34.76	35.08	35.41	35.74	36.07
28	34.39	34.72	35.05	35.37	35.71	36.05	36.38	36.72	37.06	37.40
29	35.62	35.96	36.30	36.63	36.99	37.33	37.68	38.03	38.38	38.74
30	36.85	37.20	37.55	37.90	38.26	38.62	38.98	39.34	39.71	40.07
31	38.08	38.44	30.80	39.16	39.54	39.91	40.28	40.66	41.03	41.41

	22	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
.2	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.29	0.29	0.29
.3	0.40	0.41	0.41	0.42	0.42	0.42	0.43	0.43	0.43	0.44
.4	0.54	0.54	0.55	0.55	0.56	0.56	0.57	0.57	0.58	0.58
.5	0.67	0.68	0.69	0.69	0.70	0.70	0.71	0.72	0.72	0.73
.6	0.81	0.82	0.82	0.83	0.84	0.85	0.85	0.86	0.87	0.85
.7	0.94	0.95	0.95	0.97	0.98	0.99	1.00	1.00	1.01	1.02
.8	1.08	1.09	1.10	1.11	1.13	1.13	1.14	1.15	1.16	1.17
.9	1.21	1.22	1.22	1.25	1.27	1.27	1.28	1.29	1.30	1.31
Area.	1.35	1.36	1.37	1.38	1.40	1.41	1.42	1.44	1.45	1.46
2	2.70	2.72	2.74	2.77	2.79	2.83	2.84	2.87	2.89	2.92
3	4.04	4.08	4.12	4.15	4.19	4.23	4.27	4.31	4.34	4.38
4	5.39	5.44	5.49	5.54	5.59	5.64	5.69	5.74	5.79	5.84
5	6.74	6.80	6.86	6.92	6.99	7.05	7.11	7.18	7.24	7.30
6	8.09	8.16	8.24	8.31	8.38	8.46	8.53	8.61	8.69	8.76
7	9.44	9.52	9.61	9.69	9.78	9.87	9 96	10.00	10.13	10.22
8	10.78	10.88	10.98	11.08	11.18	11.28	11.38	11.48	11.58	11.68
9	12.13	12.24	12.35	12.46	12.58	12.69	12.80	12.92	13.03	13.14
10	13.48	13.60	13.73	13.85	13.97	14.10	14.22	14.35	14.48	14.62
11	14.83	14.96	15.10	15.23	15.37	15.51	15.65	15.79	15.92	16.07
12	16.18	16.32	16.47	16.62	16.77	16.92	17.07	17.22	17.37	17.53
13	17.52	17.68	17.84	18.00	18.17	18.33	18.49	18.66	18.82	18.99
14	18.87	19.04	19.22	19.39	19.56	19.74	19.91	20.01	20.27	20.45
15	20.22	20.40	20.59	20.77	20.96	21.15	21.34	21.53	21.72	21.91
16	21.57	21.76	22.02	22.16	22.36	22.56	22.76	22.96	23.16	23.37
17	22.92	23.12	23.33	23.54	23.76	23.97	24.18	24.40	24.61	24.83
18	24.26	24.48	24.71	24.93	25.15	25.38	25.60	25.83	26.06	26.30
19	25.61	25.84	26.08	26.31	26.55	26.79	27.00	27.27	27.51	27.75
20	26.96	27.20	27.45	27.70	27.95	28.20	28.45	28.70	28.96	29.21
21	28.31	28.56	28.83	29.08	29.35	29.61	29.87	30.14	30.40	30.67
22	29.56	29.92	30.20	30.47	30.74	31.02	31.29	31.57	31.85	32.73
23	31.00	31.28	31.57	31.85	32.14	32.43	32.72	33.01	33.30	33.59
24	32.35	32.64	32.94	33.24	33.54	33.84	34.14	34.44	34.75	35.05
25	33.70	34.00	34.32	34.62	34.94	35.25	35.56	35.88	36.19	36.51
26	35.05	35.37	35.69	36.01	36.33	36.66	36.98	37.31	37.64	37.97
27	36.40	36.73	37.06	37.39	37.73	38.07	38.41	38.75	39.09	39.43
28	37.74	38.09	38.43	38.78	39.13	39.48	39.83	40.18	40.54	40.89
29	39.09	39.45	39.81	40.16	40.53	40.90	41.25	41.62	41.99	42.35
30	40.44	40.81	41.18	41.55	41.92	42.30	42.67	43.05	43.43	43.82
31	41.79	42.17	42.55	42.93	43.32	43.71	44.10	44.49	44.88	45.28

	23	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16
.2	0.29	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.32	0.32
.3	0.44	0.45	0.45	0.45	0.46	0.46	0.47	0.47	0.47	0.48
.4	0.59	0.59	0.60	0.60	0.61	0.61	0.62	0.63	0.63	0.64
.5	0.74	0.74	0.75	0.76	0.76	0.77	0.78	0.78	0.79	0.80
.6	0.88	0.89	0.90	0.91	0.91	0.92	0.93	0.94	0.95	0.95
.7	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.10	1.11
.8	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27
.9	1.33	1.34	1.35	1.36	1.37	1.38	1.40	1.41	1.42	1.43
Area.	1.47	1.49	1.50	1.51	1.52	1.53	1.55	1.56	1.58	1.59
2	2.95	2.97	3.00	3.02	3.05	3.08	3.10	3.13	3.15	3.18
3	4.42	4.46	4.50	4.54	4.57	4.61	4.65	4.69	4.73	4.77
4	5.89	5.94	6.00	6.05	6.10	6.15	6.20	6.26	6.31	6.36
5	7.37	7.43	7.50	7.56	7.62	7.69	7.76	7.82	7.89	7.95
6	8.84	8.92	8.99	9.07	9.15	9.23	9.31	9.39	9.47	9.54
7	10.31	10.40	10.49	10.58	10.67	10.77	10.86	10.95	11.04	11.14
8	11.79	11.89	12.02	12.10	12.20	12.30	12.41	12.51	12.62	12.73
9	13.26	13.37	13.49	13.61	13.72	13.84	13.96	14.08	14.20	14.32
10	14.73	14.86	14.99	15.12	15.25	15.38	15.51	15.64	15.78	15.91
11	16.21	16.35	16.49	16.63	16.77	16.92	17.06	17.21	17.35	17.50
12	17.68	17.83	17.99	18.14	18.30	18.46	18.61	18.77	18.93	19.09
13	19.15	19.32	19.49	19.66	19.82	19.99	20.17	20.34	20.51	20.68
14	20.63	20.81	20.99	21.17	21.35	21.53	21.72	21.90	22.09	22.27
15	22.10	22.29	22.49	22.68	22.87	23.07	23.27	23.47	23.66	23.86
16	23.57	23.78	23.99	24.19	24.40	24.61	24.82	25.03	25.24	25.45
17	25.05	25.26	25.48	25.70	25.92	26.15	26.37	26.59	26.82	27.04
18	26.52	26.75	26.98	27.22	27.45	27.69	27.92	28.16	28.40	28.64
19	27.99	28.24	28.48	28.73	28.97	29.22	29.47	29.72	29.97	30.23
20	29.47	29.74	29.98	30.24	30.50	30.76	31.02	31.29	31.55	31.82
21	30.94	31.21	31.48	31.75	32.02	32.30	32.57	32.85	33.13	33.41
22	32.41	32.69	32.98	33.26	33.55	33.84	34.13	34.32	34.71	35.00
23	33.89	34.18	34.48	34.78	35.07	35.38	35.68	35.98	36.28	36.59
24	35.36	35.67	35.98	36.29	36.60	36.91	37.23	37.55	37.86	38.18
25	36.83	37.15	37.48	37.80	38.12	38.45	38.78	39.11	39.44	39.77
26	38.31	38.64	38.98	39.31	39.65	39.99	40.33	40.67	41.02	41.36
27	39.78	40.12	40.48	40.82	41.17	41.53	41.88	42.24	42.59	42.95
28	41.25	41.61	41.97	42.34	42.70	43.07	43.43	43.80	44.17	44.54
29	42.73	43.10	43.47	43.85	44.22	44.60	44.98	45.37	45.75	46.14
30	44.20	44.58	44.97	45.36	45.75	46.14	46.54	46.93	47.33	47.73
31	45.67	46.07	46.47	46.87	47.27	47.68	48.09	48.50	48.91	49.32

	24	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17
.2	0.32	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.34	0.34
.3	0.48	0.49	0.49	0.49	0.50	0.50	0.51	0.51	0.51	0.52
.4	0.64	0.65	0.65	0.66	0.66	0.67	0.67	0.68	0.69	0.69
.5	0.80	0.81	0.82	0.82	0.83	0.84	0.84	0.85	0.86	0.86
.6	0.96	0.97	0.98	0.99	0.99	1.00	1.01	1.02	1.03	1.04
.7	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21
.8	1.28	1.29	1.30	1.32	1.33	1.34	1.35	1.36	1.37	1.38
.9	1.44	1.46	1.47	1.48	1.49	1.50	1.52	1.53	1.54	1.55
Area.	1.60	1.62	1.63	1.64	1.66	1.67	1.68	1.70	1.72	1.73
2	3.21	3.23	3.26	3.29	3.32	3.34	3.37	3.40	3.43	3.45
3	4.81	4.85	4.89	4.93	4.97	5.03	5.06	5.10	5.14	5.18
4	6.42	6.47	6.52	6.58	6.63	6.69	6.74	6.80	6.85	6.91
5	8.02	8.09	8.16	8.22	8.29	8.36	8.43	8.50	8.56	8.63
6	9.63	9.71	9.79	9.87	9.95	10.03	10.11	10.19	10.28	10.36
7	11.23	11.32	11.42	11.51	11.61	11.70	11.80	11.89	11.99	12.09
8	12.83	12.94	13.05	13.16	13.26	13.37	13.48	13.59	13.70	13.81
9	14.44	14.55	14.68	14.80	14.92	15.05	15.17	15.29	15.42	15.54
10	16.04	16.18	16.31	16.45	16.58	16.72	16.85	16.99	17.13	17.27
11	17.65	17.79	17.94	18.09	18.24	18.39	18.54	18.69	18.84	18.99
12	19.25	19.41	19.57	19.74	19.90	20.06	20.22	20.39	20.55	20.72
13	20.85	21.03	21.20	21.38	21,56	21.73	21.91	22.09	22.27	22.45
14	22.46	22.65	22.84	23.03	23.21	23.40	23.60	23.79	23.98	24.18
15	24.06	24.26	24.47	24.67	24.87	25.08	25.28	25.49	25.69	25.90
16	25.67	25.88	26.10	26.31	26.53	26.75	26.97	27.19	27.41	27.63
17	27.27	27.50	27.73	27.96	28.19	28.42	28.65	28.88	29.12	29.36
18	28.88	29.12	29.36	29.60	29.85	30.09	30.34	30.58	30.83	31.08
19	30.48	30.73	30.92	31.25	31.50	31.76	32.02	32.28	32.54	32.81
20	32.08	32.35	32.62	32.89	33.16	33.44	33.71	33.98	34.26	34.54
21	33.69	33.97	34.25	34.54	34.82	35.11	35.39	35.68	35.97	36.26
22	35.29	35.59	35.88	36.18	36.48	36.78	37.08	37.38	37.08	37.99
23	36.90	37.20	37.51	37.83	38.14	38.45	38.76	39.08	39.40	39.72
24	38.50	38.82	39.15	39.47	39.79	40.12	40.45	40.78	41.11	41.45
25	40.10	40.44	40.78	41.12	41.45	41.79	42.13	42.48	42.82	43.17
26	41.71	42.06	42.41	42.76	43.11	43.47	43.82	44.18	44.54	44.90
27	43.31	43.68	44.04	44.41	44.77	45.14	45.51	45.88	46.25	46.62
28	44.92	45.29	45.67	46.05	46.43	46.81	47.19	47.57	47.96	48.35
29	46.52	46.91	47.30	47.70	48.08	48.48	48.88	49.27	49.67	50.08
30	48.13	48.53	48.93	49.34	49.74	50.15	50.56	50.97	51.39	51.80
31	49.73	50.15	50.56	50.98	51.40	51.83	52.25	52.67	53.10	53.53

	25	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19
.2	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.37
.3	0.52	0.53	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.56
.4	0.70	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.75
.5	0.87	0.88	0.88	0.89	0.90	0.91	0.91	0.92	0.93	0.93
.6	1.04	1.05	1.06	1.07	1.08	1.09	1.09	1.10	1.11	1.12
.7	1.22	1.23	1.24	1.25	1.26	1.27	1.28	1.29	1.30	1.31
.8	1.39	1.40	1.41	1.43	1.44	1.45	1.46	1.46	1.48	1.49
.9	1.57	1.58	1.59	1.60	1.62	1.63	1.64	1.65	1.67	1.68
Area	1.74	1.75	1.77	1.78	1.80	1.81	1.82	1.84	1.85	1.87
2	3.48	3.51	3.54	3.57	3.59	3.62	3.65	3.68	3.71	3.74
3	5.22	5.26	5.31	5.35	5.39	5.43	5.48	5.52	5.56	5.60
4	6.96	7.02	7.07	7.13	7.19	7.24	7.30	7.36	7.41	7.47
5	8.70	8.77	8.84	8.91	8.98	9.05	9.13	9.80	9.27	9.34
6	10.44	10.53	10.61	10.70	10.78	10.87	10.95	11.04	11.12	11.21
7	12.18	12.28	12.38	12.48	12.58	12.68	12.78	12.80	12.98	13.08
8	13.93	14.04	14.15	14.26	14.37	14.49	14.60	14.72	14.83	14.95
9	15.67	15.79	15.92	16.04	16.17	16.30	16.43	16.56	16.68	16.81
10	17.41	17.55	17.69	17.83	17.97	18.11	18.25	18.39	18.54	18.68
11	19.15	19.30	19 45	19.61	19.76	19.92	20.08	20.23	20.39	20.55
12	20.89	21.06	21.22	21.39	21.56	21.73	21.90	22.07	22.25	22.42
13	22.63	22.81	22.99	23.17	23.36	23.54	23.73	23.91	24.10	24.29
14	24.37	24.56	24.76	24.96	25.15	25.35	25.55	25.75	25.95	26.15
15	26.11	26.32	26.53	26.74	26.95	27.16	27.38	27.59	27.81	28.02
16	27.85	28.07	28.30	28.52	28.75	28.98	29.20	29.43	29.66	29.89
17	29.59	29.83	30.07	30.31	30.55	30.79	31.03	31.27	31.51	31.76
18	31.33	31.58	31.84	32.19	32.34	32.60	32.85	33.11	33.37	33.63
19	33.07	33.34	33.60	33.87	34.14	34.41	34.68	34.95	35.22	35.50
20	34.81	35.09	35.37	35.65	35.94	36.22	36.50	36.79	37.08	37.36
21	36.55	36.85	37.14	37.44	37.73	38.03	38.33	38.63	38.93	39.23
22	38.30	38.60	38.91	39.22	39.53	39.84	40.15	40.47	40.78	41.10
23	40.04	40.36	40.68	41.30	41.33	41.65	41.98	42.31	42.64	42.97
24	41.78	42.11	42.45	42.78	43.12	43.46	43.80	44.15	44.49	44.84
25	43.52	43.87	44.21	44.57	44.92	45.27	45.63	45.99	46.34	46.70
26	45.26	45.62	45.98	46.35	46.72	47.09	47.45	47.83	48.20	48.57
27	47.00	47.38	47.75	48.13	48.51	48.90	49.28	49.67	50.05	50.44
28	48.74	49.13	49.52	49.92	50.31	50.71	51.11	51.51	51.91	52.31
29	50.48	50.88	51.29	51.70	52.11	52.52	52.93	53.35	53.76	54.18
30	52.22	52.64	53.06	53.48	53.90	54.33	54.76	55.19	55.61	56.05
31	53.96	54.39	54.83	55.26	55.70	56.14	56.58	57.03	57.47	57.92

	26	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.20
.2	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.40	0.40	0.40
.3	0.56	0.57	0.57	0.58	0.58	0.59	0.59	0.60	0.60	0.60
.4	0.75	0.76	0.76	0.77	0.78	0.78	0.79	0.79	0.80	0.81
.5	0.94	0.95	0.96	0.96	0.97	0.98	0.98	0.99	1.00	1.01
.6	1.13	1.14	1.15	1.16	1.16	1.17	1.18	1.19	1.20	4.21
.7	1.32	1.33	1.34	1.35	1.36	1.37	1.38	1.39	1.40	1.41
.8	1.51	1.52	1.53	1.54	1.56	1.56	1.58	1.59	1.60	1.61
.9	1.61	1.71	1.72	1.73	1.75	1.76	1.77	1.79	1.80	1.81
Area.	1.88	1.90	1.91	1.93	1.94	1.96	1.97	1.99	2.00	2.01
2	3.77	3.79	3.82	3.85	3.88	3.91	3.94	3.97	4.00	4.03
3	5.65	5.69	5.74	5.78	5.82	5.87	5.91	5.96	6.00	6.05
4	7.53	7.59	7.65	7.71	7.76	7.82	7.88	7.94	8.00	8.06
5	9.41	9.49	9.56	9.63	9.71	9.78	9.85	9.93	10.00	10.08
6	11.30	11.38	11.47	11.56	11.65	11.73	11.82	11.91	12.00	12.09
7	13.18	13.28	13.38	13.48	13.59	13.69	13.79	13.90	14.00	14.11
8	15.06	15.18	15.29	15.41	15.53	15.65	15.76	15.88	16.00	15.12
9	16.94	17.07	17.21	17.34	17.47	17.60	17.74	17.87	18.00	18.14
10	18.83	18.97	19.15	19.26	19.41	19.56	19.71	19.85	20.00	20.15
11	20.71	20.87	21.03	21.19	21.35	21.51	21.68	21.84	22.00	22.17
12	22.59	22.77	22.94	23.12	23.29	23.47	23.65	23.82	24.00	24.18
13	24.47	24.66	24.85	25.04	25.23	25.43	25.62	25.81	26.00	26.20
14	26.36	26.56	26.76	26.97	27.18	27.38	27.59	27.80	28.01	28.21
15	28.24	28.46	28.68	28.90	29.12	29.34	29.56	29.78	30.01	30.23
16	30.12	30.35	30.59	30.82	31.06	31.32	31.53	31.77	32.01	22.24
17	32.01	32.25	32.50	32.75	33.00	33.25	33.50	33.75	34.01	34.26
18	33.89	34.15	34.41	34.67	34.94	35.20	35.47	35.74	36.01	36.28
19	35.77	36.05	36.32	36.60	36.88	37.16	37.44	37.72	38.01	38.29
20	37.65	37.94	38.24	38.53	38.82	39.12	39.41	39.71	40.01	40.31
21	39.54	39.84	40.15	40.45	40.76	41.07	41.38	41.69	42.01	42.32
22	41.42	41.74	42.06	42.38	42.70	43.03	43.35	43.68	44.01	44.34
23	43.30	43.64	43.97	44.31	44.64	44.98	45.32	45.66	46.01	45.35
24	45.18	45.53	45.88	46.23	46.59	46.94	47.29	47.65	48.01	48.37
25	47.07	47.43	47.79	48.16	48.53	48.89	49.26	49.63	50.01	50.38
26	48.95	49.33	49.71	50.09	50.47	50.85	51.24	51.62	52.01	52.40
27	50.83	51.22	51.62	52.01	52.41	52.81	53.21	53.61	54.01	54.41
28	52.72	53.12	53.53	53.94	54.35	54.76	55.18	55.59	56.01	55.43
29	54.60	55.02	55.44	55.87	56.29	56.72	57.15	57.58	58.01	58.44
30	56.48	56.92	57.35	57.79	58.23	58.67	59.12	59.56	60.01	60.46
31	58.36	58.81	59.27	59.72	60.17	60.63	61.09	61.55	62.01	62.47

Cylinders in Ale-Gallons.

	27	.1	2.	.3	.4	.5	.6	.7	.8	.9
.1	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22
.2	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.43	0.43	0.43
.3	0.61	0.61	0.62	0.62	0.63	0.63	0.64	0.64	0.65	0.65
4	0.81	0.82	0.82	0.83	0.84	0.84	0.85	0.85	0.86	0.87
.5	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.07	1.08	1.08
.6	1.22	1.23	1.24	1.25	1.25	1.26	1.27	1.28	1.29	1.30
.7	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.50	1.51	1.52
.8	1.62	1.64	1.65	1.66	1.67	1.68	1.70	1.71	1.72	1.73
.9	1.83	1.84	1.85	1.87	1.88	1.90	1.91	1.92	1.94	1.95
Area.	2.03	2.05	2.06	2.08	2.09	2.11	2.12	2.14	2.15	2.17
2	4.06	4.09	4.12	4.15	4.18	4.21	4.24	4.27	4.30	4.34
3	6.09	6.14	6.18	6.23	6.27	6.32	6.36	6.41	6.46	6.50
4	8.12	8.18	8.24	8.30	8.35	8.42	8.49	8.55	8.61	8.67
5	10.15	10.23	10.30	10.38	10.45	10.53	10.61	10.68	0.76	10.84
6	12.18	12.27	12.36	12.45	12.55	12.64	12.73	12.82	12.91	13.01
7	14.21	14.32	14.42	14.53	14.64	14.74	14.85	15.00	15.07	15.17
8	16.24	16.36	16.48	16.61	16.73	16.85	16.97	17.10	17.22	17.34
9	18.27	18.41	18.54	18.68	18.82	18.96	19.09	19.23	19.37	19.51
10	20.30	20.45	20.60	20.76	20.91	21.06	21.22	21.37	21.52	21.68
11	22.33	22.50	22.67	22.83	23.00	23.17	23.34	23.51	23.68	23.85
12	24.36	24.54	24.73	24.91	25.09	25.27	25.46	25.64	25.83	26.01
13	26.39	26.59	26.79	26.98	27.18	27.38	27.58	27.78	27.98	28.18
14	28.42	28.64	28.85	29.06	29.27	29.49	29.70	29.92	30.13	30.35
15	30.45	30.68	30.91	31.14	31.30	31.59	31.82	32.05	32.29	32.52
15	32.48	32.73	32.97	33.21	33.45	33.70	33.95	34.19	34.44	34.69
17	34.51	34.77	35.03	35.29	35.55	35.81	36.02	36.33	36.59	36.85
18	36.55	36.82	37.09	37.36	37.64	37.91	38.19	38.47	38.74	39.02
19	38.58	38.86	39.15	39.44	39.73	40.02	40.32	40.60	40.90	41.19
20	40.61	40.91	41.21	41.51	41.82	42.12	42.43	42.74	43.05	43.36
21	42.64	42.[illegible]5	43.27	43.59	43.91	44.23	44.55	44.88	45.20	45.53
22	44.67	45.00	45.33	45.67	46.00	46.34	46.67	47.01	47.36	47.69
23	46.70	47.04	47.39	47.74	48.09	48.44	48.80	49.15	49.50	49.86
24	48.73	49.08	49.45	49.82	50.18	50.55	50.92	51.29	51.66	52.03
25	50.76	51.13	51.51	51.89	52.27	52.66	53.04	53.42	53.81	54.20
26	52.7[illegible]	53.18	53.57	53.97	54.36	54.76	55.16	55.56	55.06	56.37
27	54.82	55.23	55.63	56.04	56.45	56.87	57.28	57.70	58.11	58.53
28	56.85	57.27	57.69	58.12	58.54	58.97	59.40	59.84	60.27	60.70
29	58.88	59.32	59.75	60.19	60.64	61.08	61.53	61.97	62.42	62.87
30	60.91	61.36	61.81	62.27	62.73	63.19	63.05	64.11	64.57	65.04
31	62.94	63.41	63.88	64.35	64.82	65.29	65.77	66.25	66.72	67.20

	28.	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23
.2	0.44	0.44	0.44	0.45	0.45	0.45	0.46	0.46	0.46	0.46
.3	0.65	0.66	0.66	0.67	0.67	0.68	0.68	0.69	0.59	0.70
.4	0.87	0.88	0.88	0.89	0.90	0.90	0.91	0.92	0.92	0.93
.5	1.09	1.10	1.11	1.11	1.12	1.13	1.14	1.15	1.15	1.16
.6	1.31	1.32	1.33	1.34	1.35	1.36	1.37	1.38	1.39	1.40
.7	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.61	1.62	1.63
.8	1.75	1.75	1.77	1.78	1.80	1.81	1.82	1.83	1.85	1.86
.9	1.96	1.98	1.99	2.01	2.02	2.04	2.05	2.06	2.08	2.09
Area	2.18	2.20	2.21	2.23	2.25	2.26	2.28	2.29	2.31	2.33
2	4.37	4.40	4.43	4.46	4.49	4.52	4.56	4.59	4.02	4.05
3	6.55	6.60	6.64	6.69	6.74	6.79	6.83	6.88	6.93	6.98
4	8.73	8.80	8.86	8.92	8.98	9.05	9.11	9.18	9.24	9.30
5	10.92	11.00	11.07	11.15	11.23	11.31	11.39	11.47	11.55	11.63
6	13.10	13.19	13.29	3.38	13.48	13.57	13.67	13.76	13.86	13.96
7	15.28	15.39	15.50	15.61	15.72	15.83	15.95	16.06	16.17	16.28
8	17.47	17.59	17.72	17.84	17.97	18.10	18.22	18.35	18.48	18.61
9	19.65	19.79	19.93	20.07	20.22	20.36	20.50	20.65	20.79	20.93
10	21.83	21.99	22.15	22.31	22.46	22.62	22.78	22.94	23.10	23.26
11	24.02	24.19	24.36	24.54	24.71	24.88	25.06	25.23	25.41	25.59
12	26.20	26.39	26.58	26.77	26.96	27.15	27.34	27.53	27.72	27.91
13	28.39	28.59	28.79	29.00	29.20	29.41	29.61	29.82	30.03	30.24
14	30.57	30.79	31.01	31.23	31.45	31.67	31.89	32.12	32.34	32.57
15	32.75	32.99	33.22	33.46	33.69	33.93	34.17	34.41	34.65	34.89
16	34.94	35.18	35.44	35.69	35.94	36.19	36.45	36.71	36.96	37.22
17	37.12	37.38	37.65	37.92	38.19	38.46	38.73	39.00	39.27	39.54
18	39.30	39.58	39.87	40.15	40.43	40.72	41.01	41.29	41.58	41.87
19	41.49	41.78	42.08	42.38	42.68	42.98	43.28	43.59	43.89	44.20
20	43.67	43.98	44.30	44.61	44.93	45.24	45.56	45.88	46.20	46.52
21	45.85	46.18	46.51	46.84	47.17	47.51	47.84	48.18	48.51	48.85
22	48.04	48.38	48.73	49.07	49.42	49.77	50.12	50.47	50.82	51.17
23	50.22	50.58	50.94	51.30	51.66	52.03	52.40	52.76	53.13	53.50
24	52.40	52.78	53.15	53.53	53.91	54.29	54.67	55.06	55.44	55.83
25	54.59	54.98	55.37	55.76	56.16	56.55	56.95	57.35	57.75	58.15
26	56.77	57.18	57.58	58.00	58.40	58.82	59.23	59.65	60.06	60.48
27	58.95	59.38	59.80	60.23	60.65	61.08	61.51	61.94	02.37	62.80
28	61.14	61.57	62.01	62.46	52.90	63.34	63.79	64.23	64.68	65.13
29	63.32	63.77	64.23	64.69	65.14	65.60	66.06	66.53	66.99	67.46
30	65.50	65.97	66.44	66.92	67.39	67.87	68.34	68.82	69.30	69.73
31	67.69	68.17	68.86	69.15	69.64	70.13	70.62	71.12	71.61	72.11

	£ 29	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25
.2	0.47	0.47	0.47	0.48	0.48	0.48	0.49	0.49	0.49	0.50
.3	0.70	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.75	0.75
.4	0.94	0.94	0.95	0.96	0.96	0.97	0.98	0.98	0.99	1.00
.5	1.17	1.18	1.19	1.19	1.20	1.21	1.22	1.23	1 24	1.24
.6	1.40	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.49
.7	1.64	1.65	1.66	1.67	1.68	1.70	1.71	1.72	1.73	1.74
.8	1.87	1.89	1.90	1.91	1.93	1.94	1.95	1.96	1.98	1.99
.9	2.11	2.12	2.14	2.15	2.17	2.18	2.20	2.21	2.23	2.24
Ar. a	2.34	2.36	2.37	2.39	2.41	2 42	2.44	2.46	2.47	2.49
2	4.68	4.72	4.75	4.78	4.81	4.85	4.88	4.91	4.95	4.98
3	7.03	7.07	7.12	7.17	7.22	7.27	7.32	7.37	7.42	7.47
4	9.37	9.43	9.50	9.56	9.63	9.69	9.76	9.83	9.89	9.96
5	11.71	11.79	1.87	11.95	12.04	12.12	12.20	12.28	12.37	12.45
6	14.05	14.15	14.25	14.35	14.44	14.54	14.64	14.74	14.84	14.94
7	16.40	16.51	16.62	16.74	16.85	16.97	17.08	17.20	17.31	17.43
8	18.74	18.87	9.00	19.13	19.26	19.39	19.39	19.65	19.79	19.92
9	21.08	21.23	21.37	21.52	21.67	21.81	21.96	22.11	22.26	22.41
10	23.42	23.58	23.75	23.91	24.07	24.24	24.40	24.57	24.73	24.90
11	25.76	25.94	26.12	26.30	26.48	26.66	26.84	27.02	27.21	27.39
12	28.11	28.30	28.50	28.69	28.89	29.08	29.28	29.48	29.68	29.88
13	30.45	30.66	30.87	31.08	31.29	31.51	31.72	31.94	32.15	32.37
14	32.79	33.02	33.25	33.47	33.70	33.93	34.15	34.39	34.63	34.86
15	35.13	35.38	35.62	35.86	36.11	36.36	36.60	36.85	37.10	37.35
16	37.48	37.73	37.99	38.26	38.52	38.78	39.04	39.31	39.57	39.84
17	39.82	40.09	40.37	40.65	40.92	41.20	41.48	41.76	42.05	42.33
18	42.16	42.45	42.74	43.04	43.33	43.63	43.92	44.22	44.52	44.82
19	44.50	44.81	45.12	45.43	45.74	46.05	46.36	46.68	46.99	47.31
20	46.85	47.17	47.49	47.82	48.15	48 47	48.80	49.13	49.47	49.80
21	40.19	49.53	40.87	50.21	50.55	50.90	51.24	51.50	51.94	52.29
22	51.53	51.88	52.24	52.60	52.96	53.32	53.68	54.05	54.41	54.78
23	53.87	54.24	54.62	54.99	55.37	55.74	56.12	56.50	56.89	57.27
24	56.21	56.60	56.99	57.38	57.77	58.17	58.56	58.96	59.36	59.76
25	58.56	58.96	59.37	59.77	60.18	60.59	61.00	61.42	61.83	62.25
26	60.90	61.32	61.74	62.17	62.59	63.02	63.44	63.87	64.31	64.74
27	63.24	63.68	64.12	64.57	65.00	65.44	65.88	66.33	66.78	67.23
28	65.58	66.03	66.49	66.95	67.40	67.86	68.33	68.79	69.25	69.72
29	7.93	68.39	68.87	69.34	69.81	70.29	70.77	71.24	71.73	72.21
30	70.27	70.75	71.24	71.73	72.23	72.71	73.21	73.70	74.20	74.70
31	72.61	73.11	73.62	74.12	74.63	75.13	75.65	76.16	76.67	77.19

	30	1.	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.27
.2	0.50	0.50	0.51	0.51	0.51	0.52	0.52	0.52	0 53	0.53
.3	0.75	0.76	0.76	0.77	0.77	0.78	0.78	0.79	0.79	0.80
.4	1.00	1.01	1.02	1.02	1.03	1.04	1.04	1.05	1.06	1.06
.5	1.25	1.26	1.27	1.28	1.29	1.29	1.30	1.31	1.32	1.33
.6	1.50	1.51	1.52	1.53	1.54	1 55	1.56	1.57	1.58	1.60
.7	1.75	1.77	1.78	1.79	1.80	1.81	1.82	1.84	1.85	1.86
.8	2.00	2.02	2.03	2.05	2 06	2.07	2.09	2.10	2.11	2.13
.9	2 26	2.27	2.29	2.30	2 32	2.33	2.35	2.36	2.38	2.39
Area.	2.51	2.52	2.54	2.55	2.57	2 59	2 61	2.62	2.64	2.66
2	5.01	5.05	5.08	5.11	5.15	5.18	5.23	5.25	5.28	5 32
3	7.52	7.57	7.62	7.67	7.72	7.77	7.82	7.57	7.93	7.98
4	10.03	10.09	10.16	10 23	10.30	10.36	10.43	10.50	10.57	10.64
5	12.53	12.62	12.70	12.78	12.87	12.95	13.04	13.10	13.21	13.30
6	15.04	15.14	15.24	15.34	15.44	15.56	15.65	15.75	15.85	15 95
7	17.55	17.56	17.78	17.90	18.02	18.14	18.25	18.37	18.49	18.61
8	20.05	20.19	20.32	20.46	20.59	20.73	20.86	21.00	21.14	21.27
9	22.56	22.71	22.86	23.01	23.16	23.32	23.47	23 62	23.78	23.93
10	25 07	25.23	25.40	25.57	25.74	25 91	26.08	26.25	26.42	26.59
11	27.57	27.76	27.94	28.13	28.31	28.50	28.69	28.87	29.06	29.25
12	30.08	30.28	30.48	30.38	30.89	31.09	31.29	31.50	31.70	31.91
13	32.59	32.80	33.02	33.24	33.46	33.68	33.90	34.12	34 35	34.57
14	35.09	35.33	35.55	35.80	36.03	36.27	36.51	36.75	36.99	37.23
15	37.60	37.85	38.10	38.35	38.61	38.86	39.12	39.37	39.63	39.89
16	40.11	40.37	40.64	40.91	41.18	41.45	41.72	42.03	42.27	42 55
17	42.61	42.90	43.18	43.47	43.70	44.04	44.33	44.62	44.91	45.21
18	45.12	45.42	45.72	46.03	46.33	46.63	46.94	47.25	47.56	47.87
19	47.62	47.94	48.26	48.58	48.90	49.22	49.55	49.87	50.20	50.52
20	50.13	50.47	50.80	51.14	51.48	51.82	52.16	52.50	52.84	53.18
21	52.64	52.99	53.34	53.70	54.05	54.41	54.76	55.12	55.48	55.84
22	55.14	55.51	55.88	56.25	56.63	57.00	57.37	57.75	58 12	58.50
23	57.65	58.04	58.42	58.81	59.20	59.59	59.98	60 37	60.77	61.16
24	60.16	60.56	60.96	61.37	61.77	62.18	62.59	63 00	63 41	63.82
25	62.66	63.08	63.50	63.92	64.35	64.77	65.19	65.62	66.05	66.48
26	65.17	65.61	66.04	66.48	66.92	67.36	67.80	68.25	69.69	69.14
27	67.68	68.13	68.58	69.04	69.49	69.95	70.41	70.87	71.33	71.80
28	70.18	70.65	71.12	71.60	72.07	72.54	73.02	73.50	73 98	74 46
29	72.69	73.18	73.66	74.15	74.64	75.13	75.63	76.12	70.62	77.12
30	75.20	75.70	76.20	76.71	77.22	77.72	78.23	78.75	79.26	79.78
31	77.70	78.22	78.74	79.27	79.79	80.31	80.84	81.37	81.90	82.43

	31	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28
.2	0.53	0.54	0.54	0.55	0.55	0.55	0.56	0.56	0.56	0.57
.3	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85
.4	1.07	1.08	1.08	1.09	1.10	1.10	1.11	1.12	1.13	1.13
.5	1.34	1.35	1.35	1.36	1.37	1.38	1.39	1.40	1.41	1.42
.6	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70
.7	1.87	1.89	1.90	1.91	1.92	1.93	1.95	1.96	1.97	1.98
.8	2.14	2.15	2.17	2.18	2.20	2.21	2.22	2.24	2.25	2.27
.9	2.41	2.42	2.44	2.40	2.15	2.49	2.50	2.52	2.53	2.55
Area	2.68	2.6	2.71	2.73	2.75	2.76	2.73	2.80	2.82	2.83
2	5.35	5.39	5.42	5.46	5.49	5.63	5.56	5.60	5.63	5.67
3	8.03	8.08	8.13	8.19	8.24	8.29	8.34	8.40	8.45	8.50
4	10.71	10.77	10.84	10.91	10.98	11.05	11.12	11.19	11.27	11.34
5	13.38	13.47	13.55	13.64	13.73	13.82	13.90	13.99	14.08	14.17
6	16.06	16.16	16.27	16.37	16.4	16.58	16.69	16.79	16.90	17.00
7	18.73	18.85	18.98	19.10	19.22	19.34	19.47	19.59	19.71	19.84
8	21.41	21.51	21.69	21.83	21.97	22.11	22.25	22.39	22.53	22.67
9	24.09	24.24	24.40	24.56	24.71	24.87	25.03	25.19	25.35	25.51
10	26.75	26.94	27.11	27.28	27.45	27.63	27.81	27.99	28.16	28.34
11	29.44	29.63	29.82	30.01	30.21	30.40	30.59	30.79	30.98	31.17
12	32.12	32.32	32.53	32.74	32.95	33.16	33.37	33.58	33.80	34.01
13	34.79	35.02	35.24	35.47	35.70	35.93	36.15	36.38	36.61	36.84
14	37.47	37.71	37.95	38.20	38.44	38.69	38.93	39.18	39.43	39.68
15	40.15	40.41	40.67	40.93	41.19	41.45	41.72	42.03	42.25	42.51
16	42.82	43.10	43.38	43.66	43.94	44.22	44.50	44.78	45.06	45.35
17	45.50	45.79	46.09	46.38	46.68	46.98	47.28	47.58	47.88	48.18
18	48.18	48.49	48.80	49.11	49.43	49.74	50.06	50.38	50.69	51.01
19	50.85	51.18	51.51	51.84	52.17	52.51	52.84	53.17	53.51	53.85
20	53.53	53.87	54.22	54.57	54.92	55.27	55.62	55.97	56.33	56.68
21	56.21	56.57	56.93	57.30	57.67	58.03	58.40	58.77	59.14	59.52
22	58.88	59.26	59.64	60.03	60.41	60.80	61.18	61.57	61.96	62.35
23	61.56	61.95	62.35	62.76	63.16	63.56	63.96	64.37	64.78	65.18
24	64.24	64.65	65.07	65.48	65.90	66.32	66.75	67.17	67.59	68.02
25	66.91	67.34	67.78	68.21	68.65	69.09	69.53	69.97	70.41	70.85
26	69.59	70.04	70.49	70.94	71.40	71.85	72.31	72.77	73.23	73.69
27	72.26	72.73	73.20	73.67	74.14	74.61	75.09	75.56	76.04	76.52
28	74.94	75.4[illegible]	75.91	76.40	76.89	77.38	77.87	78.36	78.86	79.35
29	77.62	78.12	78.62	79.13	79.63	80.14	80.65	81.16	81.68	82.19
30	80.29	80.81	81.33	81.85	82.38	82.90	83.43	83.96	84.49	85.02
31	82.97	83.50	84.04	84.58	85.13	85.67	86.21	86.76	87.31	87.86

	32	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.28	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30
.2	0.57	0.57	0.58	0.58	0.58	0.59	0.59	0.60	0.60	0.60
.3	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90
.4	1.14	1.15	1.15	1.16	1.17	1.18	1.18	1.19	1.20	1.20
.5	1.43	1.43	1.44	1.45	1.46	1.47	1.48	1.49	1.50	1.51
.6	1.71	1.72	1.73	1.74	1.75	1.76	1.78	1.79	1.80	1.81
.7	2.00	2.01	2.02	2.03	2.05	2.06	2.07	2.08	2.10	2.11
.8	0.28	2.30	2.31	2.32	2.34	2.35	2.37	2.38	2.40	2.41
.9	2.57	2.58	2.60	2.61	2.63	2.65	2.67	2.68	2.70	2.71
Area.	2.85	2.87	2.89	2.91	2.92	2.94	2.96	2.98	3.00	3.01
2	5.70	5.74	5.77	5.81	5.85	5.88	5.92	5.96	5.99	6.03
3	8.56	8.61	8.66	8.72	8.77	8.82	8.88	8.93	8.99	9.04
4	11.41	11.48	11.55	11.62	11.69	11.77	11.84	11.91	11.98	12.06
5	14.26	14.35	14.44	14.53	14.62	14.71	14.80	14.89	14.98	15.07
6	17.11	17.22	17.33	17.43	17.54	17.65	17.76	17.87	17.98	18.09
7	19.96	20.09	20.21	20.34	20.47	20.59	20.72	20.85	20.97	21.1
8	22.81	22.96	23.10	23.25	23.39	23.53	23.68	23.82	23.97	24.12
9	25.67	25.83	25.99	26.15	26.31	26.48	26.64	26.80	26.97	27.1
10	28.52	28.70	28.88	29.06	29.24	29.42	29.60	29.78	29.96	30.1
11	31.37	31.57	31.77	31.96	32.16	32.36	32.56	32.76	32.96	33.1
12	34.22	34.44	34.65	34.87	35.08	35.30	35.52	35.74	35.96	36.17
13	37.07	37.31	37.54	37.77	38.01	38.24	38.48	38.71	38.95	39.19
14	39.93	40.18	40.43	40.68	40.93	41.18	41.44	41.69	41.95	42.2
15	42.78	43.05	43.32	43.58	43.85	44.13	44.40	44.69	44.94	45.22
16	45.63	45.92	46.20	46.49	46.78	47.07	47.36	47.65	47.94	48.2
17	48.48	48.79	49.09	49.40	49.70	50.01	50.32	50.63	50.94	51.25
18	51.33	51.66	51.98	52.30	52.63	52.95	53.28	53.61	53.93	54.2
19	54.19	54.53	54.87	55.21	55.55	55.89	56.24	56.58	56.93	57.28
20	57.04	57.40	57.75	58.11	58.47	58.84	59.20	59.56	59.93	60.29
21	59.89	60.27	60.64	61.02	61.40	61.78	62.16	62.54	62.92	63.31
22	62.74	63.14	63.53	63.92	64.32	64.72	65.12	65.52	65.92	66.3
23	65.59	66.00	66.42	66.83	67.24	67.66	68.08	68.50	68.91	69.3
24	68.45	68.87	69.30	69.74	70.17	70.60	71.04	71.47	71.91	72.3
25	71.30	71.74	72.19	72.64	73.39	73.54	74.00	74.45	74.91	75.3
26	74.15	74.61	75.08	75.55	76.02	76.49	76.96	77.43	77.90	78.3
27	77.00	77.48	77.97	78.45	78.94	79.43	79.92	80.41	80.90	81.3
28	79.85	80.35	80.86	81.36	81.86	82.37	82.88	83.39	83.90	84.4
29	82.70	83.22	83.74	84.26	84.79	85.31	85.84	86.36	86.89	87.4
30	85.56	86.09	86.63	87.17	87.71	88.25	88.80	89.34	89.89	90.4
31	88.41	88.96	89.52	90.08	90.63	91.20	91.76	92.32	92.89	93.4

	33.	1.	2.	3.	4.	.5.	6.	7.	8.	9.
.1	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32
.2	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.64	0.64
.3	0.91	0.91	0.92	0.93	0.93	0.94	0.94	0.95	0.95	0.96
.4	1.21	1.22	1.23	1.23	1.24	1.25	1.26	1.26	1.27	1.28
.5	1.52	1.53	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.60
.6	1.82	1.83	1.84	1.85	1.85	1.87	1.89	1.91	1.91	1.92
.7	2.12	2.14	2.15	2.16	2.17	2.19	2.20	2.23	2.23	2.24
.8	2.43	2.44	2.46	2.47	2.49	2.50	2.51	2.54	2.54	2.56
.9	2.73	2.75	2.76	2.78	2.81	2.81	2.83	2.86	2.86	2.88
Area	3.03	3.05	3.07	3.09	3.11	3.13	3.14	3.16	3.18	3.20
2	6.07	6.10	6.14	6.18	6.21	6.25	6.29	6.33	6.36	6.40
3	9.10	9.15	9.21	9.26	9.32	9.38	9.43	9.49	9.54	9.60
4	12.13	12.21	12.28	12.35	12.43	12.50	12.58	12.65	12.73	12.80
5	15.16	15.26	15.35	15.44	15.53	15.63	15.72	15.81	15.91	16.00
6	18.20	18.31	18.42	18.53	18.64	18.75	18.87	18.98	19.09	19.20
7	21.23	21.36	21.49	21.62	21.75	21.88	22.04	22.14	22.27	22.40
8	24.26	24.41	24.56	24.71	24.85	25.00	25.15	25.30	25.45	25.61
9	27.30	27.40	27.63	27.80	27.95	28.13	28.30	28.47	28.64	28.81
10	30.33	30.51	30.70	30.88	31.07	31.26	31.44	31.63	31.82	32.01
11	33.36	33.56	33.77	33.97	34.18	34.38	34.62	34.79	35.00	35.21
12	36.40	36.62	36.84	37.06	37.28	37.51	37.73	37.96	38.18	38.41
13	39.43	39.67	39.91	40.15	40.39	40.63	40.88	41.12	41.36	41.61
14	42.46	42.72	42.98	43.24	43.50	43.76	44.02	44.28	44.54	44.81
15	45.49	45.77	46.05	46.33	46.60	46.88	47.16	47.44	47.73	48.01
16	48.53	48.82	49.12	49.41	49.71	50.01	50.33	50.61	50.91	51.21
17	51.56	51.87	52.19	52.50	52.82	53.13	53.45	53.77	54.09	54.41
18	54.59	54.92	55.26	55.59	55.92	56.26	56.60	56.93	57.27	57.61
19	57.63	57.98	58.33	58.68	59.03	59.39	59.74	60.10	60.45	60.81
20	60.66	61.03	61.40	61.77	62.14	62.51	62.89	63.26	63.64	64.01
21	63.69	64.08	64.47	64.86	65.24	65.64	66.03	66.43	66.82	67.21
22	66.73	67.13	67.54	67.94	68.35	68.76	69.17	69.59	70.00	70.41
23	69.76	70.18	70.60	71.03	71.46	71.82	72.32	72.75	73.18	73.62
24	72.79	73.23	73.67	74.12	74.57	75.02	75.46	75.91	76.36	76.82
25	75.82	76.28	76.74	77.21	77.67	78.13	78.61	79.08	79.54	80.02
26	78.86	79.34	79.81	80.30	80.78	81.27	81.75	82.24	82.73	83.22
27	81.89	82.39	82.88	83.39	83.89	84.39	84.90	85.40	85.91	86.42
28	84.92	85.44	85.95	86.47	86.99	87.52	88.04	88.57	89.09	89.62
29	87.96	88.49	89.02	89.56	90.10	90.64	91.18	91.73	92.27	92.82
30	90.99	91.54	92.09	92.65	93.21	93.77	94.33	94.89	95.45	96.02
31	94.02	94.59	95.16	95.74	96.31	96.89	97.47	98.05	98.64	99.22

	34	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34
.2	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68
.3	0.97	0.97	0.98	0.98	0.99	0.99	1.00	1.01	1.01	1.02
.4	1.29	1.29	1.30	1.31	1.32	1.33	1.33	1.34	1.35	1.36
.5	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70
.6	1.93	1.94	1.95	1.97	1.98	1.99	2.00	2.01	2.0	2.03
.7	2.25	2.27	2.28	2.29	2.31	2.32	2.33	2.35	2.36	2.37
.8	2.58	2.59	2.61	2.62	2.64	2.65	2.67	2.63	2.70	2.71
.9	2.90	2.91	2.93	2.95	2.97	2.98	3.00	3.02	3.04	3.05
Area.	3.22	3.24	3.26	3.28	3.30	3.31	3.33	3.35	3.37	3.39
2	6.44	6.48	6.51	6.55	6.59	6. 3	6.67	6.71	6.75	6.78
3	9.66	9.72	9.77	9.83	9.89	9.94	10.00	10.06	10.12	10.18
4	12.88	12.95	13.03	13.11	13.18	13.26	13.34	13.41	13.49	13.57
5	16.10	16.19	16.29	16.38	16.48	16.57	16.67	15.77	16.86	16.96
6	19.32	19.43	19.55	19.66	19.77	19.89	20.00	20.12	20.24	20.35
7	22.54	22.67	22.80	22.94	23.07	23.20	23.34	23.47	23.61	23.75
8	25.76	25.91	26.06	26.21	26.37	26.52	26.67	26.83	26.98	27.14
9	28.98	29.15	29.32	29.49	29.66	29.83	30.01	30 13	30.36	30.53
10	32.20	32.38	32.58	32.77	32.96	33.15	33.34	33.58	33.73	33.92
11	35.42	35.62	35.83	36.04	36.25	36.16	36.68	36.89	37.10	37.31
12	38.63	38.86	39.09	39.32	39.55	39.78	40.04	40.24	40.47	40.71
13	41.85	42.10	42.35	42.60	42.84	43.07	43.34	43.60	43.85	44.10
14	45.07	45.34	45.61	45.87	46.14	46.41	46.68	46.95	47.22	47.49
15	48.29	48.58	48.86	49.15	49.44	49.72	50.01	50.30	50.59	50.83
16	51.51	51.82	52.12	52.42	52.73	53.04	53.35	53.66	53.97	54 28
17	54.73	55.05	55.36	55.70	56.03	56.35	56.68	57.01	57.34	57.07
18	57.95	58.29	58.64	58.98	59. 2	59.67	60.02	60.36	60.71	61.06
19	61.17	61.53	61.89	62.25	62.52	62.98	63.35	63.72	64.08	64.45
20	64.39	64.77	65.15	65.53	65.92	66.30	66.68	67.07	67.46	67.85
21	67.61	68.01	68.41	68.18	69.21	68.51	70.02	70.42	70.83	71.24
22	70.83	71.25	71.67	72.08	72.51	72.93	73.35	73.78	74.20	74.63
23	74.05	74.49	74.92	75.36	75.80	76.24	76.69	77.13	77.58	78.02
24	77.27	77.72	78.18	78.64	79.10	79.56	80.02	80.48	80.95	81.41
25	80.49	80.96	81.44	81.91	82.39	82.87	83.35	83.84	84.32	84.81
26	83.71	84.20	84.70	85.19	85.69	86.19	86.69	87.19	87.69	88.20
27	86.93	87.44	87.95	88.47	88.99	89.50	90.02	90.54	91.07	91.59
28	90.15	90.68	91.21	91.74	92.28	92.82	93.36	93.90	94.44	94.98
29	93.37	93.92	94.47	95.02	95.58	96.13	96.69	97.25	97.81	98.38
30	96.59	97.15	97.73	98.30	98.87	99.45	100.03	100.60	101.19	101.77
31	99.81	100.39	100.99	101.57	102.17	102.76	103.36	103.96	104.56	105.16

	35	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.36	0.36
.2	0.68	0.69	0.69	0.69	0.70	0.70	0.71	0.71	0.71	0.72
.3	1.02	1.03	1.03	1.04	1.05	1.05	1.06	1.06	1.07	1.08
4.	1.36	1.37	1.38	1.39	1.40	1.40	1.41	1.42	1.43	1.44
.5	1.71	1.72	1.72	1.73	1.74	1.75	1.76	1.77	1.78	1 79
.6	2.05	2.06	2.07	2.08	2.09	2.11	2.12	2.13	2.14	2.15
.7	2.39	2.40	2.42	2.43	2.44	2.46	2.47	2.48	2.50	2.51
.8	2.73	2.74	2.76	2.78	2.79	2.81	2.82	2.84	2.86	2 87
.9	3.07	3.09	3.11	3.12	3.14	3.16	3 18	3.19	3.21	3.23
Area	3.41	3 .43	3.45	3.47	3.49	3.51	3.53	3.55	3.57	3.59
2	6.82	6.86	6.92	6.94	6.98	7.02	7 06	7.10	7.14	7.18
3	10.23	10.29	10.35	10.41	10.47	10.53	10.59	10 65	10.71	10.77
4	13.65	13.72	13.80	13.88	13.96	14.04	14.12	14.20	14.28	14.36
5	17.06	17.16	17.25	17.35	17.45	17.55	17.65	17.75	17.08	17.95
6	20.47	20.59	20.70	20.82	20.94	21.06	21.18	21.30	21.42	21.54
7	23.88	24.02	24.16	24.29	24.43	24.57	24.71	24.85	24.99	25.13
8	27.29	27.45	27.61	27.76	27.92	28 08	28.24	28.40	28.56	28.72
9	30.70	30.88	31.06	31 23	31.41	31.59	31.77	31.95	32.12	32.30
10	34.12	34.31	34.51	34.70	34.90	35.10	35.30	35.50	35.69	35.89
11	37.53	37.74	37.96	38.17	38.39	38.61	38.83	39.05	39.26	39 48
12	40.94	41.18	41.41	41.65	41.88	42.14	42.36	42 59	42.83	43.07
13	44.35	44.61	44.86	45.12	45.37	45.63	45.89	46.14	46 40	46.66
14	47.76	48.04	48.31	48.59	48.86	49.14	49.42	49.69	49.97	50.25
15	51.18	51.47	51.76	52.06	52.35	52.65	52.95	53.24	53.54	53.84
16	54.59	54.90	55.21	55.53	55.84	56.16	56.47	56.79	57.11	57.43
17	58.00	58.33	58.66	59.00	59.33	59.67	60.00	60.34	60.68	61.02
18	61.41	61.76	62.11	62.47	62.82	63.18	63.53	63.89	64 25	64.61
19	64.82	65.20	65.56	65.94	66.31	66.69	67.06	67.44	67.82	68.20
20	68.23	68.63	69.02	69.41	69.80	70.20	70.59	70.99	71.39	71.79
21	71.65	72.06	72.47	72.88	73.29	73.71	74.12	74.54	74.96	75 38
22	75.06	75.49	75.92	76.35	76.78	77.22	77.05	78.09	78.53	78 97
23	78.47	78.92	79.37	79.82	80.27	80.73	81.18	81.64	82.10	82.56
24	81.88	82.35	82.82	83.29	83.76	84.24	84 71	85.19	85.67	86.15
25	85.29	85.78	86.27	86.76	87.25	87.75	88 24	88.74	89.24	89.74
26	88.70	89.21	89.72	90.23	90.74	91.26	91.77	92.29	92.81	93.33
27	92.12	92.64	93.17	93.70	94.23	94.77	95.30	95 84	96.38	96.92
28	95.53	96.08	96.62	97.17	97.73	98.28	98.83	99.39	99.95	100.51
29	98.94	99.51	100.09	100.64	101.21	101.79	102.36	102.94	103.51	104.09
30	102.35	102.94	103.52	104.11	104.71	105.30	105.89	106.46	107.08	107.68
31	105.76	106.27	106.97	107.58	108.20	108.81	109.42	110.04	110.65	111.27

	36	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.38	0.38
.2	0.72	0.73	0.73	0.73	0.74	0.74	0.75	0.75	0.75	0.76
.3	1.08	1.09	1.09	1.20	1.11	1.11	1.12	1.13	1.13	1.14
.4	1.44	1.45	1.46	1.47	1.48	1.48	1.49	1.50	1.51	1.52
.5	1.80	1.81	1.82	1.83	1.84	1.85	1.87	1.88	1.89	1.90
.6	2.17	2.18	2.19	2.20	2.21	2.23	2.24	2.25	2.26	2.28
.7	2.53	2.54	2.55	2.57	2.58	2.60	2.61	2.63	2.64	2.65
.8	2.89	2.90	2.92	2.94	2.95	2.97	9.98	3.00	3.02	3.03
.9	3.25	3.27	3.28	3.30	3.32	3.34	3.36	3.38	3.39	3.41
Area.	3.61	3.63	3.65	3.67	3.69	3.71	3.73	3.75	3.77	3.79
2	7.22	7.26	7.30	7.34	7.38	7.42	7.46	7.50	7.54	7.58
3	10.83	10.89	10.95	11.01	11.07	11.13	11.19	11.25	11.31	11.38
4	14.44	24.52	14.60	14.68	14.76	14.84	14.92	15.00	15.09	15.17
5	18.05	18.15	18.25	18.35	18.45	18.55	18.65	18.76	18.86	18.96
6	21.66	21.78	21.90	22.02	22.14	22.26	22.38	22.51	22.63	22.75
7	25.27	25.41	25.55	25.69	25.83	25.97	26.12	26.20	26.40	26.55
8	28.88	29.04	29.20	29.36	29.52	29.68	29.85	30.01	30.17	30.34
9	32.49	32.67	32.85	33.03	33.21	33.39	33.58	33.76	33.94	34.13
10	36.09	36.30	36.50	36.70	36.90	37.10	37.31	37.51	37.72	37.92
11	39.70	39.93	40.15	40.37	40.59	40.81	41.04	41.26	41.49	41.71
12	43.31	43.55	43.80	44.04	44.28	44.72	44.77	45.01	45.20	45.51
13	46.92	47.18	47.45	47.71	47.97	48.23	48.50	48.77	49.03	49.30
14	50.53	50.81	51.10	51.38	51.66	51.95	52.23	52.52	52.85	53.09
15	54.14	54.44	54.75	55.05	55.35	55.66	55.96	56.27	56.58	56.88
16	57.75	58.07	58.29	58.72	59.04	59.37	59.69	60.02	60.35	60.67
17	61.30	61.70	62.04	62.39	62.73	63.08	63.42	63.77	64.12	64.47
18	64.97	65.33	65.69	66.06	66.42	66.79	67.15	67.52	67.89	68.26
19	68.58	68.96	69.34	69.73	70.11	70.50	70.88	71.27	71.66	72.05
20	72.19	72.59	72.99	73.40	73.80	74.21	74.62	75.02	75.43	75.84
21	75.80	76.22	76.64	77.07	77.49	77.92	78.35	78.77	79.21	79.64
22	79.41	79.85	80.29	80.74	81.18	81.63	82.08	82.53	82.98	83.43
23	83.02	83.48	83.94	84.41	84.87	85.34	85.81	86.28	86.75	87.22
24	86.63	87.11	87.59	88.08	88.56	89.05	89.54	90.03	90.52	91.01
25	90.24	90.74	91.24	91.75	92.25	92.76	93.27	93.78	94.29	94.80
26	93.85	94.37	94.89	95.42	96.00	96.47	97.00	97.53	98.06	98.60
27	97.46	98.00	98.54	99.09	99.63	100.18	100.73	101.28	101.84	102.39
28	101.07	101.63	102.19	102.76	103.32	103.89	104.46	105.03	105.61	106.18
29	104.68	105.26	105.84	106.43	107.01	107.60	108.19	108.78	109.38	109.97
30	108.28	108.89	109.49	110.10	110.70	111.31	111.92	112.54	113.15	113.77
31	111.89	112.52	113.14	113.77	114.39	115.02	115.65	116.29	116.92	117.56

	37	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40
.2	0.76	0.77	0.77	0.77	0.78	0.78	0.79	0.79	0.80	0.80
.3	1.14	1.15	1.16	1.16	1.17	1.17	1.18	1.19	1.19	1.20
.4	1.52	1.53	1.54	1.55	1.56	1.57	1.57	1.58	1.59	1.60
.5	1.91	1.92	1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00
.6	2.29	2.30	2.31	2.32	2.34	2.35	2.36	2.37	2.39	2.40
.7	2.67	2.68	2.70	2.71	2.73	2.74	2.76	2.77	2.79	2.80
.8	3.05	3.07	3.08	3.10	3.12	3.13	3.15	3.17	3.18	3.20
.9	3.43	3.45	3.47	3.49	3.51	3.52	3.54	3.56	3.58	3.60
Area.	3.81	3.83	3.85	3.87	3.90	3.92	3.94	3.96	3.98	4.00
2	7.63	7.67	7.71	7.75	7.79	7.83	7.87	7.92	7.96	8.00
3	11.44	11.50	11.56	11.62	11.69	11.75	11.81	11.87	11.94	12.00
4	15.25	15.33	15.42	15.50	15.58	15.67	15.75	15.83	15.92	16.00
5	19.06	19.17	19.27	19.37	19.48	19.58	19.69	19.79	19.90	20.00
6	22.88	23.00	23.12	23.25	23.37	23.50	23.62	23.75	23.88	24.00
7	26.69	26.83	26.98	27.12	27.27	27.42	27.56	27.71	27.86	28.00
8	30.50	30.67	30.83	31.00	31.17	31.33	31.50	31.67	31.84	32.00
9	34.31	34.50	34.69	34.87	35.06	35.25	35.44	35.63	35.82	36.00
10	38.13	38.33	38.54	38.75	38.96	39.16	39.37	39.58	39.79	40.00
11	41.94	42.17	42.39	42.62	42.85	43.08	43.31	43.54	43.77	44.01
12	45.75	46.00	46.25	46.50	46.75	47.00	47.25	47.50	47.75	48.01
13	49.57	49.83	50.10	50.37	50.64	50.91	51.19	51.46	51.73	52.01
14	53.38	53.67	53.96	54.25	54.54	54.83	55.12	55.42	55.71	56.01
15	57.19	57.50	57.81	58.12	58.44	58.75	59.06	59.38	59.69	60.01
16	61.00	61.33	61.67	62.00	62.33	62.66	63.00	63.33	63.67	64.01
17	64.82	65.17	65.52	65.87	66.23	66.58	66.94	67.29	67.65	68.01
18	68.63	69.00	69.37	69.75	70.12	70.50	70.87	71.25	71.63	72.01
19	72.44	72.83	73.23	73.62	74.02	74.41	74.81	75.21	75.61	76.01
20	76.26	76.67	77.08	77.50	77.91	78.33	78.75	79.17	79.60	80.01
21	80.07	80.50	80.94	81.37	81.81	82.25	82.69	83.13	83.57	84.01
22	83.88	84.33	84.79	85.25	85.71	86.16	86.62	87.08	87.55	88.01
23	87.69	88.17	88.64	89.12	89.60	90.08	90.56	91.04	91.53	92.01
24	91.51	92.00	92.50	93.00	93.50	94.00	94.50	95.00	95.51	96.01
25	95.32	95.83	96.35	96.87	97.39	97.91	98.44	98.96	99.49	100.01
26	99.13	99.67	100.21	100.75	101.29	101.83	102.37	102.92	103.47	104.01
27	102.95	103.50	104.06	104.62	105.18	105.75	106.31	106.88	107.45	108.01
28	106.76	107.33	107.91	108.50	109.08	109.66	110.25	110.83	111.43	112.01
29	110.57	111.17	111.77	112.37	112.97	113.58	114.19	114.79	115.41	116.01
30	114.38	115.00	115.62	116.25	116.87	117.49	118.12	118.75	119.38	120.01
31	118.20	118.84	119.48	120.12	120.77	121.41	122.06	122.71	123.36	124.02

	38	.1	2.	.3	.4	.5	.6	.7	.8	.9
.1	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42
.2	0.80	0.80	0.81	0.82	0.82	0.83	0.83	0.83	0.84	0.84
.3	1.21	1.21	1,22	1.23	1.23	1.24	1.24	1.25	1.26	1.26
.4	1.61	1.62	1.63	1.63	1.64	1.65	1.66	1.67	1.68	1.69
.5	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.09	2.10	2.11
.6	2.41	2.43	2.44	2.45	2.46	2.48	2.49	2.50	2.52	2.53
.7	2.81	2.83	2.84	2.86	2.87	2.89	2.90	2.92	2.93	2.95
.8	3.22	3.23	3.25	3.27	3.29	3.30	3.32	3.34	3.35	3.37
.9	3.62	3.64	3.66	3.68	3.70	3.72	3.73	3.75	3.77	3.79
Area.	4.02	4.04	4.06	4.09	4.11	4.13	4.15	4.17	4.19	4.21
2	8.04	8.09	8.13	8.17	8.21	8.26	8.30	8.34	8.39	8.43
3	12.06	12.13	12.19	12.26	12.32	12.38	12.45	12.51	12.58	12.64
4	16.09	16.17	16.26	16.34	16.43	16.51	16.60	16.68	16.77	16.86
5	20.11	20.21	20.32	20.43	20.53	20.64	20.75	20.86	20.96	21.07
6	24.13	24.26	24.38	24.51	24.64	24.77	24.90	25.03	25.16	25.29
7	28.15	28.30	28.45	28.60	28.75	28.90	29.05	29.20	29.39	29.50
8	32.17	32.34	32.51	32.68	32.85	33.03	33.20	33.37	33.58	33.71
9	36.19	36.39	36.58	36.77	36.96	37.15	37.35	37.54	37.77	37.93
10	40.22	40.43	40.64	40.85	41.07	41.28	41.50	41.71	41.96	42.14
11	44.24	44.47	44.70	44.94	45.17	45.41	45.65	45.88	46.16	46.36
12	48.26	48.51	48.77	49.02	49.28	49.54	49.80	50.05	50.31	50.57
13	52.28	52.56	52.83	53.11	53.39	53.67	53.95	54.23	54.51	54.79
14	56.30	56.60	56.90	57.20	57.50	57.80	58.10	58.40	58.70	59.00
15	60.33	60.64	60.96	61.28	61.60	61.92	62.25	62.57	62.89	63.22
16	64.3	64.64	65.03	65.37	65.71	66.05	66.39	66.74	67.08	67.43
17	68.37	68.73	69.09	69.45	69.82	70.18	70.54	70.91	71.38	71.64
18	72.28	72.77	73.15	73.54	73.92	74.31	74.69	75.08	75.47	75.86
19	76.30	76.81	77.22	77.62	78.03	78.44	78.84	79.25	79.66	80.07
20	80.43	80.86	81.28	81.71	82.14	82.56	83.99	83.42	83.86	84.29
21	84.46	84.90	85.35	85.79	86.24	86.69	87.14	87.59	88.05	88.50
22	88.48	88.94	89.41	89.88	90.35	90.82	91.29	91.77	92.24	92.72
23	92.50	92.99	93.47	93.96	94.46	94.95	95.44	95.94	96.43	96.93
24	96.52	97.03	97.54	98.05	98.56	99.08	99.59	100.11	100.63	101.15
25	100.54	101.07	101.60	102.13	102.67	103.20	103.74	104.28	104.82	105.36
26	104.56	105.12	105.67	106.22	106.77	107.22	107.89	108.45	109.01	109.57
27	108.59	109.16	109.73	110.31	110.88	111.46	112.04	112.62	113.21	113.79
28	112.61	113.20	113.79	114.39	114.99	115.59	116.19	116.79	117.40	118.00
29	116.63	117.24	117.86	118.48	119.10	119.72	120.34	120.96	121.59	122.22
30	120.65	121.29	121.92	122.56	123.20	123.85	124.49	125.14	125.78	126.43
31	124.67	125.33	125.99	126.65	127.31	127.97	128.64	129.31	129.98	130.65

	39	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44
.2	0.85	0.85	0.86	0.86	0.86	0.87	0.87	0.88	0.88	0.89
.3	1.27	1.28	1.29	1.29	1.30	1.30	1.31	1.32	1.32	1.33
.4	1.69	1.70	1.72	1.72	1.73	1.74	1.75	1.76	1.76	1.77
.5	2.12	2.13	2.15	2.15	2.16	2.17	2.18	2.19	2.21	2.22
.6	2.54	2.55	2.57	3.88	2.59	2.61	2.62	2.63	2.65	2.66
.7	2.96	2.98	3.00	2.51	3.03	3.04	3.06	3.07	3.09	3.10
.8	3.39	3.41	3.42	3.04	3.46	3.48	3.49	3.51	3.53	3.55
.9	3.81	3.83	3.85	3.47	3.89	3.91	3.93	3.95	3.97	3.99
Area.	4.24	4.26	4.28	4.30	4.32	4.35	4.37	4.39	4.41	4.43
2	8.47	8.52	8.56	8.60	8.6	8.70	8.73	8.78	8.82	8.87
3	12.71	12.77	12.84	12.90	12.97	13.04	13.10	13.17	13.23	13.30
4	16.94	17.23	17.12	17.21	17.29	17.38	17.47	17.56	17.65	17.74
5	21.18	21.29	21.40	21.51	21.62	21.73	21.84	21.95	22.06	22.17
6	25.42	25.55	25.68	25.81	25.94	26.07	26.20	26.34	26.47	26.60
7	29.65	29.80	29.96	30.11	30.26	30.42	30.57	30.73	30.88	31.04
8	33.89	34.06	34.24	34.41	34.59	34.76	34.94	35.12	35.29	35.47
9	38.12	38.32	38.52	38.71	38.9	39.11	39.31	39.51	39.71	39.90
10	42.36	42.58	42.80	43.02	43.23	43.45	43.67	43.90	44.12	44.34
11	46.60	46.84	47.08	47.32	47.56	47.80	48.04	48.29	48.53	48.77
12	50.83	51.09	51.36	51.62	51.88	52.14	52.41	52.67	52.94	53.21
13	55.07	55.35	55.64	55.92	56.21	56.49	56.78	57.06	57.35	57.64
14	59.31	59.61	59.92	60.22	60.53	60.84	61.14	61.45	61.76	62.07
15	63.54	63.87	64.20	64.52	64.85	65.18	65.51	65.84	66.18	66.51
16	67.78	68.13	68.47	68.83	69.18	69.53	69.88	70.23	70.59	70.94
17	72.01	72.38	72.75	73.13	73.50	73.87	74.25	74.62	75.00	75.38
18	76.25	76.64	77.03	77.43	77.82	78.22	78.61	79.01	79.41	79.81
19	80.49	80.90	81.31	81.73	82.15	82.56	83.00	83.40	83.82	84.24
20	84.72	85.16	85.59	86.03	86.47	86.91	87.35	87.79	88.23	88.68
21	88.96	89.42	89.87	90.33	90.79	91.25	91.72	92.18	92.65	93.11
22	93.19	93.67	94.15	94.63	95.12	95.60	96.08	96.57	97.06	97.55
23	97.43	97.93	98.43	98.94	99.44	99.94	100.45	100.96	101.47	101.98
24	101.67	102.19	102.71	103.24	103.76	104.29	104.82	105.35	105.88	106.41
25	105.90	106.45	106.99	107.54	108.09	108.63	109.19	109.74	110.29	110.85
26	110.14	110.71	111.27	111.84	112.41	112.98	113.55	114.13	114.70	115.28
27	114.37	114.96	115.55	116.14	116.73	117.33	117.92	118.52	119.12	119.72
28	118.61	119.22	119.83	120.44	121.06	121.67	122.29	122.91	123.53	124.15
29	122.85	123.48	124.11	124.75	125.38	126.02	126.66	127.30	127.94	128.58
30	127.08	127.74	128.39	129.05	129.70	130.36	131.02	131.69	132.35	133.02
31	131.32	131.99	134.67	133.35	134.03	134.71	135.39	136.08	136.76	137.45

	40	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.45	0.45	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.47
.2	0.89	0.90	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93
.3	1.34	1.34	1.35	1.36	1.36	1.37	1.38	1.38	1.39	1.40
.4	1.78	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.85	1.86
.5	2.23	2.24	2.25	2.26	2.27	2.28	2.30	2.31	2.32	2.33
.6	2.67	2.69	2.70	2.71	2.73	2.74	2.75	2.77	2.78	2.80
.7	3.12	3.13	3.15	3.17	3.18	3.20	3.21	3.23	3.25	3.26
.8	3.56	3.58	3.60	3.62	3.64	3.65	3.67	3.69	3.71	3.73
.9	4.01	4.03	4.05	4.07	4.09	4.11	4.13	4.15	4.17	4.19
Area	4.46	4.48	4.50	4.52	4.55	4.57	4.59	4.61	4.64	4.66
2	8.91	8.96	9.00	9.05	9.09	9.14	9.18	9.23	9.27	9.32
3	13.37	13.44	13.50	13.57	13.64	13.70	13.77	13.84	13.91	13.98
4	17.82	17.91	18.00	18.09	18.18	18.27	18.36	18.45	18.54	18.64
5	22.28	22.39	22.50	22.62	22.73	22.84	22.95	23.07	23.18	23.29
6	26.74	26.87	27.00	27.14	27.27	27.41	27.54	27.68	27.82	27.95
7	31.19	31.35	31.51	31.66	31.82	31.98	32.14	32.29	32.45	32.61
8	35.65	35.83	36.01	36.19	36.37	36.55	36.73	36.91	37.09	37.27
9	40.11	40.31	40.51	40.71	40.91	41.11	41.32	41.52	41.73	41.93
10	44.56	44.78	45.01	45.23	45.46	45.68	45.91	46.13	46.36	46.59
11	49.02	49.26	49.51	49.76	50.00	50.25	50.50	50.75	51.00	51.25
12	53.47	53.74	54.01	54.28	54.55	54.82	55.09	55.36	55.63	55.91
13	57.93	58.22	58.51	58.80	59.09	59.39	59.68	59.98	60.27	60.57
14	62.39	62.70	63.01	63.33	63.64	63.96	64.27	64.59	64.91	65.22
15	66.84	67.18	67.51	67.85	68.19	68.52	68.86	69.20	69.54	69.88
16	71.30	71.66	72.01	72.37	72.73	73.09	73.45	73.82	74.18	74.54
17	75.76	76.13	76.51	76.90	77.28	77.66	78.04	78.43	78.82	79.20
18	80.21	80.61	81.01	81.42	81.82	82.23	82.63	83.04	83.45	83.86
19	84.67	85.09	85.51	85.94	86.37	86.80	87.22	87.66	88.09	88.52
20	89.12	89.57	90.02	90.47	90.91	91.37	91.81	92.27	92.72	93.18
21	93.58	94.05	94.52	94.99	95.46	95.93	96.41	96.89	97.36	97.84
22	98.04	98.53	99.02	99.51	100.01	100.50	101.00	101.50	102.00	102.50
23	102.49	103.00	103.52	104.04	104.55	105.07	105.59	106.11	106.63	107.15
24	106.95	107.48	108.02	108.56	109.10	109.64	110.18	110.72	111.27	111.81
25	111.40	111.96	112.52	113.08	113.64	114.22	114.77	115.34	115.90	116.47
26	115.86	116.44	117.02	117.61	118.19	118.78	119.36	119.95	120.54	121.13
27	120.32	120.92	121.52	122.13	122.73	123.34	123.95	124.56	125.18	125.79
28	124.77	125.40	126.02	126.65	127.28	127.91	128.54	129.18	129.81	130.45
29	129.23	129.88	130.52	131.18	131.83	132.48	133.18	133.79	134.45	135.11
30	133.69	134.35	135.02	135.70	136.37	137.08	137.72	138.40	139.09	139.77
31	138.14	138.83	139.52	140.22	140.92	141.62	142.31	143.02	143.72	144.45

	41	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.47	0.47	0.47	0.47	0.48	0.47	0.48	0.48	0.49	0.49
.2	0.94	0.94	0.95	0.95	0.95	0.96	0.96	0.97	0.97	0.98
.3	1.40	1.41	1.42	1.42	1.43	1.44	1.45	1.45	1.46	1.47
.4	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.95	1.96
.5	2.34	2.35	2.36	2.37	2.39	2.40	2.41	2.42	2.43	2.44
.6	2.81	2.82	2.84	2.85	2.86	2.88	2.89	2.91	2.92	2.93
.7	3.28	3.29	3.31	3.33	3.34	3.36	3.37	3.39	3.41	3.42
.8	3.75	3.76	3.78	3.80	3.82	3.84	3.86	3.87	3.89	3.91
.9	4.21	4.23	4.25	4.28	4.30	4.32	4.34	4.36	4.38	4.40
Area	4.68	4.70	4.73	4.75	4.77	4.80	4.82	4.84	4.87	4.89
2	9.36	9.41	9.45	9.50	9.55	9.59	9.64	9.69	9.73	9.78
3	14.05	14.11	14.18	14.25	14.33	14.32	14.46	14.53	14.60	14.67
4	18.73	18.82	18.91	19.00	19.09	19.19	19.28	19.37	19.46	19.56
5	23.41	23.52	23.64	23.75	23.87	23.98	24.10	24.21	24.33	24.45
6	28.09	28.23	28.36	28.50	28.64	28.78	28.92	29.06	29.20	29.34
7	32.77	32.93	33.09	33.25	33.41	33.58	33.74	33.90	34.06	34.23
8	37.45	37.64	37.82	38.00	38.19	38.37	38.56	38.74	38.93	39.12
9	42.14	42.34	42.55	42.75	42.96	43.17	43.38	43.59	43.80	44.01
10	46.82	47.05	47.27	47.50	47.73	47.97	48.20	48.43	48.66	48.89
11	51.50	51.75	52.00	52.26	52.51	52.76	53.02	53.27	53.53	53.78
12	56.18	56.45	56.73	57.01	57.28	57.56	57.48	58.12	58.39	58.67
13	60.86	61.16	61.46	61.76	62.06	62.36	62.66	62.96	63.26	63.56
14	65.54	65.86	66.18	66.51	66.83	67.15	67.48	67.86	68.13	68.45
15	70.23	70.57	70.91	71.26	71.60	71.95	72.30	72.64	72.99	73.34
16	74.91	75.27	75.64	76.01	76.38	76.75	77.12	77.49	77.86	78.23
17	79.59	79.98	80.37	80.76	81.15	81.54	81.94	82.33	82.73	83.12
18	84.27	84.68	85.09	85.51	85.92	86.34	86.70	87.17	87.59	88.01
19	88.95	89.39	89.82	90.26	90.40	91.12	91.58	92.02	92.46	92.93
20	93.64	94.09	94.55	95.01	95.97	95.43	96.40	96.86	97.32	97.79
21	98.32	98.80	99.28	99.76	100.44	100.73	101.22	101.70	102.19	102.68
22	103.00	103.50	104.00	104.51	105.02	105.52	106.04	106.55	107.06	107.57
23	107.68	108.21	108.73	109.26	109.79	110.32	110.85	111.39	111.92	112.46
24	112.36	112.91	113.46	114.01	114.56	115.12	115.67	116.23	116.79	117.35
25	117.04	117.61	118.19	118.76	119.34	119.91	120.49	121.07	121.65	122.24
26	121.73	121.32	122.91	123.51	124.11	124.71	125.21	125.92	126.52	127.12
27	126.41	127.02	127.64	128.26	128.88	129.51	130.13	130.76	131.39	132.02
28	131.09	131.73	132.37	133.01	133.66	134.30	134.95	135.60	136.25	136.91
29	135.77	136.43	137.10	137.76	138.43	139.10	139.77	140.45	141.12	141.80
30	140.45	141.14	141.82	142.51	143.20	143.90	144.59	145.29	145.99	146.68
31	145.14	145.84	146.55	147.27	147.98	148.69	149.41	150.13	150.85	151.57

	42	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.49	0.39	0.50	0.50	0.50	0.50	0.51	0.51	0.51	0.51
.2	0.98	0.99	0.99	1.00	1.00	1.01	1.01	1.02	1.02	1.02
.3	1.47	1.48	1.49	1.49	1.50	1.51	1.52	1.52	1.53	1.54
.4	1.96	1.97	1.98	1.99	2.00	2.01	2.02	2.03	2.04	2.05
.5	2.46	2.47	2.48	2.49	2.50	2.51	2.53	2.54	2.55	2.56
.6	2.95	2.96	2.98	2.99	3.00	3.02	3.03	3.05	3.06	3.08
.7	3.44	3.46	3.47	3.4	3.50	3.52	3.54	3.55	3.57	3.59
.8	3.93	3.95	3.97	3.99	4.01	4.02	4.04	4.06	4.08	4.10
.9	4.42	4.44	4.46	4.48	4.51	4.53	4.55	4.57	4.59	4.61
Area.	4.91	4.94	4.96	4.98	5.01	5.03	5.05	5.08	5.10	5.13
2	9.83	9.87	9.92	9.97	10.01	10.06	10.11	10.16	10.20	10.25
3	14.74	14.81	14.88	14.95	15.02	15.09	15.16	15.23	15.31	15.38
4	19.65	19.74	19.84	19.95	20.03	20.12	20.22	20.31	20.41	20.54
5	24.56	24.68	24.80	24.92	25.03	25.15	25.27	25.39	25.51	25.63
6	29.48	29.62	29.76	29.90	30.04	30.18	30.33	30.47	30.61	30.75
7	34.39	34.55	34.72	34.88	35.05	35.21	35.38	35.55	35.71	35.88
8	39.30	39.49	39.68	39.87	40.05	40.24	40.43	40.62	40.81	41.01
9	44.22	44.43	44.64	44.85	45.06	45.28	45.4	45.70	45.92	46.13
10	49.13	49.13	49.60	49.83	50.07	50.31	50.54	50.78	51.02	51.26
11	54.04	54.30	54.56	54.82	55.08	55.34	55.60	55.86	56.12	56.38
12	58.95	59.24	59.52	59.[illegible]0	60.08	60.37	60.65	60.94	61.22	61.51
13	63.87	64.17	64.48	64.78	65.09	65.40	65.71	66.01	66.32	66.63
14	68.78	69.11	69.44	69.77	70.10	70.43	70.76	71.09	71.43	71.76
15	73.69	74.04	74.40	74.75	75.10	75.45	75.81	76.17	76.53	76.89
16	78.61	78.98	79.36	7[illegible].73	80.11	80.49	80.87	81.25	81.63	82.01
17	83.52	83.92	84.32	84.72	85.12	85.52	85.92	86.33	86.73	87.14
18	88.43	88.85	89.20	89.70	90.12	90.55	90.98	91.4[illegible]	91.83	92.26
19	93.34	93.79	94.24	94.68	95.13	95.58	96.03	96.48	96.94	97.39
20	98.26	98.73	99.20	100.00	100.14	100.61	101.09	101.57	102.04	102.51
21	103.17	103.66	104.16	104.65	105.14	105.64	106.14	106.64	107.14	107.65
22	108.08	108.60	109.12	109.63	110.15	110.67	111.19	111.72	112.24	112.77
23	113.00	113.53	114.08	114.62	115.16	115.70	116.25	116.79	117.34	117.89
24	117.91	118.47	119.03	119.60	120.17	120.73	121.30	121.87	122.45	123.02
25	122.82	123.41	123.99	124.59	125.17	125.75	126.36	126.95	127.55	128.14
26	127.74	128.34	128.95	129.57	130.18	130.80	131.41	132.03	132.65	133.27
27	132.65	133.28	133.91	134.55	135.17	135.83	136.47	137.11	137.75	138.39
28	137.56	138.22	138.87	139.53	140.19	140.86	141.52	142.18	142.85	143.52
29	142.47	143.15	143.83	144.52	145.20	145.89	146.57	147.26	147.95	148.65
30	147.39	148.09	148.79	149.50	150.21	150.92	151.63	152.34	153.06	153.77
31	152.30	153.03	153.75	154.48	155.21	155.95	156.68	157.42	158.16	158.90

	43	1.	.2	3.	.4	.5	.6	.7	.8	.9
.1	0.51	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0 54
.2	1.03	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.07	1.07
.3	1.54	1.55	1.56	1 57	1.57	1.58	1.59	1.60	1.60	1.61
.4	2.05	2.07	2.08	2.09	2.10	2.11	2.12	2.13	2.14	2.15
.5	2.57	2.59	2.60	2.61	2.62	2.63	2.65	2.66	2.17	2.68
.6	3 09	3.10	3.12	3.13	3.17	3.16	3.1	3.1	3.21	3.22
.7	3.60	3.62	3.64	3.65	3.67	3 6	3.71	3.72	3.74	3.76
.8	4.12	4.14	4.16	4.18	4.20	4.22	4.24	4.25	4.27	4.29
.9	4.63	4.66	4.68	4.70	4.72	4.74	4.76	4.79	4.81	4.83
Area.	5.15	5.17	5.20	5.22	5.25	5.27	5.29	5.32	5.34	5.37
2	10.30	10.35	10.40	10.44	10.49	10.54	10.59	10.64	10.6	10.73
3	15.45	15.52	15.59	15.67	15.74	15.81	15.88	15. 6	16.03	16.10
4	20.60	20.69	20.79	20.89	20.98	21.08	21.18	2 .27	21.37	21.47
5	25.75	25.87	25.99	26.11	26.23	26.35	25.47	26.5	26.71	26.84
6	30.90	31.04	31.19	31.33	31.48	31.62	31.77	31.91	32.0	32.20
7	36.05	36.21	36.38	36.55	36.72	36.	37.06	37.23	37.40	37.57
8	41.20	41.39	41.58	41.77	41.97	42.16	42.3	42.55	42.74	42.94
9	46 35	46.5	46.78	47.00	47.21	47.43	47.55	47.87	48.05	48.31
10	51.50	51.74	51.98	52.22	52 46	52.70	52.94	53.15	53 43	53 67
11	56.65	56.91	57.17	57 44	57.71	57.97	58.24	58.51	58 77	59.04
12	61.79	62.08	62.37	62.66	62.95	63.24	63.53	63.82	64.12	64.41
13	66.94	67.26	67.57	67.88	68.20	60.51	68.83	69.14	69.46	69.78
14	72.09	72.43	72.77	73.10	73.44	73.78	74.12	74.46	74.80	75.14
15	77.24	77.60	77 97	78.33	78.69	79.05	79.42	79.78	80.14	80 51
16	82.39	82 78	83.16	83 55	83.93	84.32	84.71	85. 0	85.4	85.88
17	87.54	87.9	88.36	88.77	89.18	89.59	90.00	90.42	90.83	91.25
18	92.6	93.12	93.56	93 99	94.43	94.86	95.30	95.74	96.17	96.61
19	97.84	98.30	98.76	99.21	94.67	100.13	100.59	101.05	101.52	102.00
20	102.99	103.47	103.95	104.44	104.92	105.40	105.90	106.37	106.86	107.35
21	108.14	108 65	109.15	100.66	110.16	110.67	111 18	11 .6	112.20	112.72
22	113 2	113.8.	114.35	114.88	115.41	115.94	116.48	17.01	117.55	118.08
23	118.44	118.99	119.55	120.10	120.66	121.21	121.77	122.33	22.89	123.45
24	123.55	124.17	124.74	125.32	125.90	126.48	127.07	127.65	128.23	128.82
25	128.74	129.34	129.94	130.54	131.15	131.75	132.36	132.97	133.57	134.19
26	133.89	134.51	135.14	135.77	136.39	137.02	137.65	138.29	138.02	139.55
27	139.0	139.69	140.34	140.99	141 64	142.29	142. 5	143.60	144.26	144.92
28	144.19	144.86	145.54	145.21	146.88	147.56	148.24	148.92	149.60	150.29
29	149.34	150.03	150.73	151.43	152.13	152.83	153.54	154.24	154.95	155.66
30	154.4	155.21	155.93	156.65	157.3	158.10	158.83	159.56	160.29	161.02
31	159.64	160.38	161.13	161.88	162 62	163.37	164.13	64.88	165.63	166.39

	44	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.5	0.55	0.56
.2	1.08	1.08	1.09	1.09	1.10	1.10	1.11	1.11	1.12	1.12
.3	1,62	1.62	1.63	1.64	1.65	1.65	1.65	1.6	1.68	1.68
.4	2.15	2.17	2.18	2.19	2.20	2.21	2.22	2.23	2.24	2.25
.5	2.70	2.71	2.72	2.73	2.74	2.76	2.77	2.78	2.79	2.81
.6	3.23	4.25	3.26	3.28	3.29	3.31	3.32	3.34	3.35	3.37
.7	3.77	3.79	3.81	3.83	3.84	3.86	3.88	3.90	3.91	3.93
.8	4.31	4.33	4.35	4.37	4.39	4.41	4.43	4.45	4.47	4.49
.9	4.85	4.87	4.90	4.92	4.94	4.96	4.99	5.01	5.0	5.05
Area.	5.39	5.42	5.44	5.47	5.49	5.51	5.54	5.56	5.59	5.61
2	10.78	10.83	10.88	10.93	10.98	11.03	11.08	11.13	11.18	11.23
3	16.18	16.25	16.32	16.40	16.47	16.55	16.62	16.69	16.77	16.84
4	21.57	21.67	21.76	21.86	21.96	22.06	22.16	22.26	22.36	22.46
5	26.96	27.08	27.21	27.33	27.45	27.58	27.70	27.82	27.95	28.07
6	32.35	32.50	32.6	32.79	32.94	33.09	33.24	33.39	33.54	33.69
7	37.74	37.92	38.09	38.26	38.4	38.61	38.78	38.95	39.13	39.30
8	43.14	43.33	43.53	43.73	43.92	44.12	44.32	44.52	44.72	44.92
9	48.53	48.75	48.97	49.19	49.41	49.64	49.86	50.08	50.31	50.53
10	53.92	54.16	54.41	54.66	54.90	55.15	55.40	55.65	55.90	56.15
11	59 31	59.58	59.85	60.12	60.39	60.67	60.94	61.21	61.49	61.76
12	64.70	65.00	65.29	65.5	65.88	66.13	66.48	66.78	67.08	67. 8
13	70.10	70.41	70.73	71.05	71.37	71.70	72.02	72.34	72.67	72.99
14	75.49	75.83	76.18	76.52	76.87	77.21	77.56	77.91	78.26	78.61
15	80.88	81.25	81.62	81.99	82.36	82.73	83.10	83.4	83.85	84.22
16	86.27	86.66	87.06	87.45	87.85	88.24	88.64	8 .04	89.44	89.84
17	91.66	92.08	92.50	92.92	93.34	93.70	94.18	94.60	95.03	95.45
18	97.06	97.50	97.94	98.38	98.83	99.27	99.72	100.17	100.62	101.07
19	102.45	102.91	103.38	103.85	104.32	104.79	105.26	05.72	106.21	106.68
20	107.84	108.33	108.82	109.31	109.81	110.30	110.80	111.30	111.80	112 30
21	113.23	113.75	114.26	114.78	115.30	115.81	116.34	116.86	117.38	117.01
22	118.62	119.16	119.70	120.25	20.79	121.33	121.88	122.43	122 98	123.53
23	124.02	124.58	125.14	125.71	126.2	126.85	127.42	1 7.99	128.57	129.14
24	129.41	130.00	130.59	131.18	131.77	132.36	133.05	33.56	134.15	134.75
25	134.80	135.41	136.03	136.64	137.26	137.88	138.50	139.12	139.74	140,37
26	140.19	140.82	141.47	142.11	142.75	143.26	144.04	44.69	145.33	145.98
27	145.58	146.25	146.91	147.57	148.24	148.91	14 .58	50.25	50 92	151.60
28	150.97	151.66	152.35	153.0	153.73	154.43	155.12	155.82	156.51	157.21
29	156.37	157.08	157.79	158.51	159.22	159.94	160.66	161. 8	162.10	162 83
30	161.76	16 .49	163.23	163.97	164.71	165.46	166.20	166.95	167.6	168.41
31	167.15	167.91	168.67	169.44	170.20	170.97	171.74	172.51	173.28	174,06

Cylinders in Ale-Gallons

	45.	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.56	0.57	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.59
.2	1.13	1.13	1.14	1.14	1.15	1.15	1.16	1.16	1.17	1.17
.3	1.69	1.7	1.71	1.71	1.72	1.73	1.74	1.74	1.75	1.76
.4	2.26	2.27	2.28	2.29	2.30	2.31	2.32	2.33	2.34	2.35
.5	2.82	2.83	2.8	2.85	2.87	2.88	2.90	2.91	2.92	2.93
.6	3.38	3.40	3.41	3.43	3.44	3.46	3.47	3.49	3.50	3.52
.7	3.95	3.97	3,98	4.00	4.02	4.04	4.05	4.07	4.09	4.11
.8	4.51	4.53	4.55	4.57	4.59	4.61	4.63	4.65	4.67	4.69
.9	5.08	5.10	5.12	5.14	5.17	5.19	5.21	5.23	5.26	5.28
Area	5.64	5.66	5.69	5.72	5. 4	5.77	5.79	5.82	5.84	5.87
2	11.28	11.33	11.38	11.43	11.48	11.53	11.58	11.63	11.68	11.74
3	16.92	16.99	17.07	17.14	17.22	17.30	17.37	17.45	17.53	17.60
4	22.56	22.65	22.76	22.86	22.96	23.06	23.16	23.27	23.37	23.47
5	28.20	28.32	28.55	28.58	28.70	28.83	28.96	29.08	29.21	29.34
6	33.84	33.99	34. 4	34.29	34.44	34.60	34.75	34.00	35.05	35.21
7	39.48	39.65	39.83	40.01	40.18	40.36	40.54	40.72	40.89	41.07
8	45.12	45.32	45.52	45.72	45.92	46.18	46.33	46.53	46.74	46.94
9	50.76	50.99	51.21	51.44	51.60	51.89	52.12	52.35	52.58	52.81
10	56.40	56.65	56.90	57.15	57.40	57.66	57.91	58.17	58.42	58.68
11	62.04	62.31	62.59	62.87	63.15	63.4	63.70	63.98	64.26	64.54
12	67.68	67.98	68.28	68.58	68.89	69.19	69.49	69.80	70.10	70.41
13	73.32	73.64	73.97	74.30	74.6	74.96	75.29	75.62	75.95	76.28
14	78.96	79.31	79.66	80.01	80.37	80.72	81.08	81.43	81.79	82.15
15	84.60	84.97	85.35	85.73	86.11	86.49	86.87	87.25	87.63	88.02
16	90.24	90.64	91.04	91.14	91.85	92.25	92.66	93.07	93.47	93.88
17	95.88	96.30	96.73	97.16	97.59	98.02	98.45	98.88	99.32	99.75
18	101.52	101.97	102.42	102.88	103.33	103.79	104.24	104.70	105.16	105.62
19	107.16	107.63	108.11	108.59	109.07	109.55	110.03	110.52	111.00	111.49
20	112.80	113.30	113-80	114.31	114.81	115.32	115.82	116.33	116.84	117.35
21	118.44	118.96	119.49	120.02	120.55	121.08	121.61	122.15	122.68	123.92
22	124.08	124.63	125.18	125.74	126.29	126.85	127.41	127.97	128.53	129.09
23	129.72	130.29	130.87	131.45	132.03	132.62	133.20	133.78	134.37	134.96
24	135.3	135.96	136.55	137.17	137.77	138.38	138.99	139.60	140.21	140.82
25	140.99	141.62	142.25	142.88	143.51	144.15	144.78	145.42	146.05	145.69
26	146.63	147.29	147.94	148.60	149.25	149.91	150.57	151.23	151.89	152.56
27	152.27	152.95	153.63	154.31	154.99	155.68	156.36	157.05	157.74	158.43
28	157.91	158.62	159.32	150.03	160.73	161.44	162.15	162.87	163.58	164.30
29	163.55	164.28	165.01	165.74	166.47	167.21	1 7.94	168.68	169.42	170.16
30	169.19	169.95	170.70	171.46	172.21	172.98	173.74	174.50	175.26	176.03
31	174.83	175.61	176.39	177.17	177.96	178.74	179.53	180.32	181.10	181.90

	46	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.61	0.61
.2	1.18	1.18	1.19	1.19	1.20	1.20	1.21	1.21	1.22	1.22
.3	1.77	1.78	1.78	1.79	1.80	1.81	1.81	1.82	1.83	1.84
.4	2.36	2.37	2.38	2.39	2.40	2.41	2.42	2.43	2.44	2.45
.5	2.95	1.96	2.97	2.98	3.00	3.01	3.02	3.04	3.05	3.06
.6	3.54	3.55	3.57	3.58	3.00	3.01	3.63	3.64	3.66	3.68
.7	4.13	4.14	4.16	4.18	4.20	4.23	4.23	4.25	4.27	4.29
.8	4.71	4.73	4.76	4.78	4.80	4.84	4.84	4.86	4.88	4.90
.9	5.30	5.33	5.35	5.37	5.40	5.44	5.44	5.47	5.49	5.51
Area.	5.89	5.92	5.94	5.97	6.00	6.02	6.05	6.07	6.10	6.13
2	11.17	11.84	11.89	11.94	11.99	12.04	12.10	12.15	12.20	12.25
3	17.68	17.76	17.83	17.91	17.99	18.07	18.14	18.22	18.30	18.38
4	23.57	23.68	23.78	23.88	23.98	24.09	24.19	24.30	24.40	24.50
5	29.47	29.59	29.72	29.85	29.98	30.11	30.24	30.37	30.50	30.63
6	35.36	35.51	35.67	35.82	35.98	36.13	36.29	36.44	36.60	36.76
7	41.25	41.43	41.61	41.79	41.97	42.15	42.34	42.52	42.70	42.88
8	47.15	47.35	47.56	47.76	47.97	48.18	48.38	48.59	48.80	49.01
9	53.04	53.27	53.50	53.73	53.97	54.20	54.43	54.67	54.90	55.13
10	58.93	59.19	59.45	59.70	59.96	60.22	60.48	60.74	61.00	61.26
11	64.83	65.11	65.39	65.67	65.96	66.24	66.53	66.81	67.10	67.39
12	70.72	71.03	71.33	71.64	71.95	72.26	72.58	72.89	73.20	73.51
13	76.61	76.95	77.28	77.61	77.95	78.29	78.62	78.96	79.30	79.64
14	82.51	82.86	83.22	83.59	83.95	84.31	84.67	85.04	85.40	85.77
15	88.40	88.78	89.17	89.56	89.94	90.33	90.72	91.11	91.50	91.89
16	94.29	94.70	95.11	95.53	95.94	96.35	96.77	97.18	97.60	98.02
17	100.19	100.62	101.06	101.50	101.94	102.38	102.82	103.26	103.70	104.14
18	106.08	106.54	107.00	107.47	107.93	108.40	108.86	109.33	109.80	110.27
19	111.97	112.46	112.95	113.44	113.93	114.42	114.91	115.41	115.90	116.40
20	117.87	118.38	118.89	119.41	119.92	120.44	120.96	121.48	122.00	122.52
21	123.76	124.30	124.84	125.38	125.92	126.46	127.01	127.55	128.10	128.65
22	129.65	130.22	130.78	131.35	131.92	132.49	133.06	133.63	134.20	134.77
23	135.55	136.13	136.73	137.32	137.91	138.51	139.10	139.70	140.30	140.90
24	141.44	142.05	142.67	143.29	143.91	144.53	145.15	145.78	146.40	147.03
25	147.33	147.97	148.61	149.26	149.90	150.55	151.20	151.85	152.50	153.15
26	153.23	153.89	154.56	155.23	155.90	156.57	157.25	157.92	158.60	159.28
27	159.12	159.81	160.50	161.20	161.90	162.60	163.30	164.00	164.70	165.40
28	165.01	165.73	166.45	167.17	167.89	168.62	169.34	170.07	170.80	171.53
29	170.91	171.65	172.39	173.14	173.89	174.64	175.39	176.15	176.90	177.66
30	176.80	177.57	178.34	179.11	179.89	180.66	181.44	182.22	183.00	183.78
31	182.69	183.49	184.28	185.08	185.88	186.68	187.49	188.29	189.10	189.91

	47	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.01	0.62	0.62	0.02	0.03	0.63	0.63	0.63	0.64	0.64
.2	1.23	1.24	1.25	1.25	1.25	1.26	1.26	1.27	1.27	1.28
.3	1.85	1.84	1.87	1.87	1.88	1.88	1.89	1.90	1.91	1.92
.4	2.46	2.47	2.49	2.49	2.50	2.51	2.52	2.53	2.55	2.56
.5	3.08	3.09	3.10	3.12	3.13	3.14	3.15	3.17	3.19	3.19
.6	3.69	3.71	3.72	3.74	3.75	3.77	3.79	3.80	3.82	3.83
.7	4.31	4.32	4.34	4.36	4.38	4.40	4.42	4.44	4.45	4.47
.8	4.92	4.94	4.96	4.98	5.01	5.03	5.05	5.07	5.09	5.11
.9	5.53	5.56	5.58	5.61	5.63	5.66	5.68	5.70	5.72	5.75
Area.	6.15	6.10	6.20	6.23	0.26	6.28	0.31	0.34	6.30	6.39
2	12.30	12.36	12.41	12.40	12.51	12.57	12.02	12.67	12.73	12.78
3	18.46	18.54	18.61	18.69	18.77	18.85	18.93	19.01	19.06	19.17
4	24.61	24.71	24.82	24.92	25.03	25.14	25.24	25.35	25.45	25.56
5	30.76	30.89	31.02	31.16	31.29	31.42	31.55	31.68	31.82	31.95
6	36.91	37.07	37.23	37.39	37.54	37.70	37.86	38.02	38.18	38 34
7	43.07	43.25	43.43	43.62	43.80	43.99	44.17	44.36	44.54	44.73
8	49.22	49.43	49.64	49.85	50.06	50.27	50.48	50.69	50.91	51.12
9	55.37	55.61	55.84	56.08	56.32	56.55	56.79	57.03	57.27	57.51
10	61.52	61.78	62.05	62.31	62.57	62.84	63.10	63.37	63 63	63.90
11	67.67	67.96	68.25	68.54	68.83	69.12	69.41	69.71	70.00	70.29
12	73.83	74.14	74.45	74.77	75.09	75.41	75.72	76.04	70.36	70.68
13	79.98	80.32	80.66	81.00	81.35	81.69	82.03	82.38	82.73	83.07
14	86.13	86.50	86.87	87.24	87.60	87.97	88.35	88.72	89.09	89,46
15	92.28	92.58	93.07	93.47	93.36	94.26	94.66	95.05	95.45	95.85
16	98.44	98.86	99.28	99.70	100.12	100.55	100.97	101.39	101.82	102.24
17	104.59	105.03	105.48	105.93	100.38	106.83	107.28	107 73	108.18	108.03
18	110.74	111.21	111.69	112.16	112.63	113.11	113.61	114.06	114.54	115.02
19	116.89	117.39	117.89	118.39	118.89	119.39	119.92	120.40	120.91	121.41
20	123.05	123.57	124.10	124.62	125.15	125.68	126.21	126.74	127.27	127.80
21	129.20	129.75	130.30	130.85	131.41	131.96	132.52	133.07	133.63	134.19
22	135.35	135.93	136.51	137.03	137.66	138.25	138.83	139.41	140.00	140.58
23	141.50	142.11	142.71	143.31	143.92	144.53	145.14	145.75	146.36	146.97
24	147.65	148.25	148.91	149.55	150.18	150.81	151.45	152.09	152.72	153.36
25	153.81	154.40	155.12	155.78	156.44	157.10	157.76	158.42	159.09	159.75
26	159.96	160.64	161.22	162.04	162.69	163.38	164.07	164.76	165.45	166.14
27	166.11	166.8	167.53	168.24	168.95	169.00	170.38	171.10	171.81	172.54
28	172.26	173.00	173.73	174.47	175.21	175.95	176.69	177.43	178.18	178.93
29	178.42	179.18	179.94	180.70	181.47	182.22	183.00	183.77	184.54	185.32
30	184.57	185.35	186.14	186.93	187.72	188.52	189.31	190.15	190.90	191.71
31	190.72	191.53	192.35	193.16	193.98	194.80	195.62	196.44	197 27	198.10

	48	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.64	0.64	0.65	0.65	0.65	0.65	0.66	0.66	0.66	0.67
.2	1.28	1.29	1.29	1.30	1.30	1.31	1.32	1.32	1.33	1.33
.3	1.92	1.93	1.94	1.95	1.96	1.97	1.97	1.98	1.99	2.00
.4	2.57	2.58	2.59	2.60	2.61	2.62	2.63	2.64	2.65	2.66
.5	3.21	3.22	3.23	3.25	3.26	3.28	3.29	3.30	3.32	3.33
.6	3.85	3.87	3.88	3.90	3.91	3.93	3.95	3.96	3.98	4.00
.7	4.49	4.51	4.53	4.55	4.57	4.59	4.60	4.62	4.64	4.66
.8	5.13	5.15	5.18	5.20	5.22	5.24	5.26	5.28	5.31	5.33
.9	5.77	5.80	5.82	5.85	5.87	5.90	5.92	5.94	5.97	5.99
Area.	6.42	6.44	6.47	6.50	6.52	6.55	6.58	6.61	6.63	6.66
2	12.83	12.89	12.94	12.99	13.05	13.10	13.16	13.21	13.26	13.32
3	19.25	19.33	19.41	19.49	19.57	19.65	19.73	19.82	19.90	19.98
4	25.67	25.77	25.88	25.99	26.10	26.20	26.31	26.42	26.53	26.64
5	32.08	32.22	32.35	32.49	32.62	32.76	32.89	33.03	33.16	33.30
6	38.50	38.66	38.82	38.98	39.15	39.31	39.47	39.63	39.79	39.96
7	44.92	45.10	45.29	45.48	45.67	45.86	46.05	46.24	46.43	46.62
8	51.33	51.55	51.76	51.98	52.19	52.41	52.63	52.84	53.06	53.28
9	57.75	57.99	58.23	58.48	58.72	58.96	59.20	59.45	59.69	59.94
10	61.17	64.44	64.70	64.97	65.24	65.51	65.78	66.05	66.32	66.60
11	70.59	70.88	71.18	71.47	71.77	72.06	72.36	72.66	72.96	73.26
12	77.00	77.32	77.65	77.97	78.29	78.62	78.94	79.26	79.59	79.92
13	83.42	83.77	84.12	84.46	84.82	85.17	85.52	85.87	86.22	86.58
14	89.84	90.21	90.59	90.96	91.34	91.72	92.10	92.48	92.86	93.24
15	96.25	96.65	97.06	97.46	97.86	98.27	98.67	99.08	99.49	99.90
16	102.67	103.10	103.53	103.96	104.39	104.82	105.25	105.69	106.12	106.56
17	109.09	109.54	110.00	110.45	110.91	111.37	111.83	112.29	112.75	113.22
18	115.50	115.98	116.47	116.95	117.44	117.92	118.41	118.93	119.38	119.88
19	121.92	122.43	122.94	123.45	123.96	124.47	124.99	125.50	126.02	126.54
20	128.34	128.87	129.41	129.95	130.49	131.03	131.57	132.11	132.65	133.20
21	134.75	135.32	135.88	136.44	137.01	137.58	138.14	138.71	139.28	139.86
22	141.17	141.76	142.35	142.94	143.53	144.13	144.72	145.32	145.91	146.52
23	147.59	148.20	148.82	149.44	150.06	150.68	151.30	151.92	152.55	153.18
24	154.01	154.65	155.29	155.93	156.58	157.23	157.88	158.13	159.18	159.83
25	160.42	161.09	261.76	162.43	163.11	163.78	164.46	165.13	165.81	166.49
26	166.84	167.53	168.23	168.93	169.63	170.33	171.04	171.74	172.44	173.15
27	173.26	173.98	175.70	175.43	176.16	176.88	177.51	178.35	179.06	179.81
28	179.67	180.42	181.17	181.92	182.68	183.44	184.19	184.95	185.71	186.42
29	186.09	187.86	187.64	188.42	189.20	189.99	190.77	191.56	192.34	193.13
30	192.51	193.31	194.11	194.92	195.73	196.54	197.35	198.16	198.97	199.79
31	198.92	199.75	200.59	201.42	202.25	203.09	203.93	204.77	05.61	206.45

Cylinders in Ale-Gallons.

	49	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.67	0.67	0.67	0.68	0.68	0.68	0.68	0.69	0.69	0.69
.2	1.34	1.34	1.35	1.35	1.36	1.36	1.37	1.38	1.38	1.39
.3	2.01	2.01	2.02	2.03	2.04	2.05	2.05	2.07	2.07	2.08
.4	2.67	2.69	2.70	2.71	2.72	2.73	2.74	2.76	2.76	2.77
.5	3.34	3.36	3.37	3.38	3.40	3.41	3.43	3.45	3.45	3.47
.6	4.01	4.03	4.04	4.06	4.08	4.09	4.11	4.13	4.14	4.16
.7	4.68	4.70	4.72	4.74	4.76	4.78	4.80	4.82	4.83	4.85
.8	5.35	5.37	5.39	5.42	5.44	5.46	5.48	5.50	5.53	5.55
.9	6.02	6.04	6.07	6.09	6.12	6.14	6.17	6.19	6.22	6.24
Area	6.69	6.71	6.74	6.77	6.80	6.82	6.85	6.88	6.91	6.93
2	13.37	13.43	13.48	13.54	13.59	13.65	13.70	13.76	13.81	13.87
3	20.06	20.14	20.22	20.31	20.39	20.47	20.56	20.64	20.72	20.80
4	26.75	26.86	26.97	27.08	27.19	27.30	27.41	27.52	27.63	27.74
5	33.43	33.57	33.71	33.85	33.98	34.12	34.26	34.40	34.54	34.67
6	40.12	40.29	40.45	40.61	40.78	40.94	41.11	41.28	41.44	41.61
7	46.81	47.00	47.19	47.38	47.58	47.77	47.96	48.16	48.35	48.54
8	53.50	53.71	53.93	54.15	54.37	54.59	54.81	55.03	55.26	55.48
9	60.18	60.43	60.68	60.92	61.17	61.42	61.67	61.91	62.16	62.41
10	66.87	67.14	67.42	67.69	67.97	68.24	68.52	68.79	69.07	69.35
11	73.56	73.86	74.16	74.45	74.76	75.07	75.37	75.67	75.98	76.28
12	80.24	80.57	80.90	81.23	81.56	81.89	82.22	82.55	82.89	83.22
13	86.93	87.29	87.64	88.00	88.36	88.71	89.07	89.43	89.81	90.15
14	93.62	94.00	94.38	94.77	95.15	95.54	95.92	96.31	96.70	97.09
15	100.30	100.71	101.13	101.54	101.95	102.36	102.78	103.19	103.61	104.02
16	106.99	107.43	107.87	108.31	108.75	109.19	109.63	110.07	110.51	110.96
17	113.68	114.14	114.61	115.08	115.54	116.01	116.48	116.95	117.42	117.89
18	120.38	120.86	121.35	121.85	122.34	122.84	123.33	123.83	124.33	124.83
19	127.02	127.57	129.09	128.61	129.14	129.66	130.18	130.71	131.24	131.76
20	133.70	134.29	134.83	135.38	135.93	136.48	137.04	137.59	138.14	138.70
21	140.43	141.00	141.58	142.15	142.73	143.31	143.89	144.47	145.05	145.63
22	147.11	147.71	148.32	148.92	149.52	150.13	150.74	151.35	151.96	152.57
23	153.80	154.43	153.06	155.69	156.32	156.95	157.59	158.23	158.87	159.50
24	160.49	161.14	161.80	162.46	163.12	163.78	164.44	165.11	165.77	166.44
25	167.17	167.86	168.54	169.23	169.91	170.60	171.29	171.98	172.68	173.37
26	173.86	174.57	175.28	176.00	176.71	177.43	178.15	178.86	179.59	180.31
27	180.55	181.29	182.03	182.77	183.51	184.25	185.00	185.74	186.49	187.24
28	187.24	188.00	188.77	189.54	190.30	191.08	191.85	192.62	193.40	194.18
29	193.92	194.71	195.51	196.31	197.10	197.90	198.70	199.50	200.31	201.11
30	200.61	201.43	202.25	203.08	203.90	204.73	205.55	206.38	207.22	208.05
31	207.30	208.14	208.99	209.84	210.69	211.55	212.41	213.26	214.12	214.98

	50	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.70	0.70	0.70	0.70	0.71	0.71	0.71	0.72	0.72	0.72
.2	1.39	1.40	1.40	1.41	1.41	1.42	1.43	1.43	1.44	1.44
.3	2.09	2.10	2.11	2.11	2.12	2.13	2.14	2.15	2.16	2.16
.4	2.78	2.80	2.81	2.82	2.83	2.84	2.85	2.86	2.87	2.89
.5	3.48	3.50	3.51	3.52	3.54	3.55	3.57	3.58	3.59	3.61
.6	4.18	4.19	4.21	4.23	4.24	4.26	4.28	4.30	4.31	4.33
.7	4.87	4.89	4.91	4.93	4.95	4.97	4.99	5.01	5.03	5.05
.8	5.57	5.59	5.61	5.64	5.66	5.68	5.70	5.73	5.75	5.77
.9	6.27	6.29	6.32	6.34	6.37	6.39	6.42	6.44	6.47	6.49
Area	6.96	6.99	7.02	7.05	7.07	7.10	7.13	7.16	7.19	7.22
2	13.93	13.98	14.04	14.09	14.15	14.21	14.26	14.32	14.37	14.43
3	20.89	20.97	21.06	21.14	21.22	21.31	21.39	21.48	21.56	21.65
4	27.85	27.96	28.07	28.19	28.30	28.41	28.52	28.64	28.75	28.86
5	34.81	34.95	35.09	35.23	35.37	35.51	35.65	35.80	35.94	36.08
6	41.78	41.94	42.11	42.28	42.45	42.62	42.79	42.95	43.12	43.29
7	48.74	48.93	49.13	49.33	49.52	49.72	49.92	50.11	50.31	50.51
8	55.70	55.92	56.15	56.37	56.60	56.82	57.05	57.27	57.50	57.73
9	62.66	62.92	63.17	63.42	63.67	63.92	64.18	64.43	64.69	64.94
10	69.63	69.91	70.19	70.47	70.75	71.03	71.31	71.59	71.87	72.16
11	76.59	76.90	77.20	77.51	77.82	78.13	78.44	78.75	79.06	79.37
12	83.55	83.89	84.22	84.56	84.89	85.23	85.57	85.91	86.25	86.59
13	90.52	90.88	91.24	91.61	91.97	92.33	92.70	93.07	93.43	93.80
14	97.48	97.87	98.26	98.65	99.04	99.44	99.83	100.23	100.62	101.02
15	104.44	104.86	105.28	105.70	106.12	106.54	106.96	107.42	107.81	108.24
16	111.40	111.85	112.30	112.75	113.19	113.64	114.09	114.55	115.00	115.45
17	118.37	118.84	119.32	119.79	120.27	120.75	121.22	121.70	122.18	122.67
18	125.33	125.83	126.33	126.84	127.34	127.83	128.36	128.86	129.37	129.88
19	132.29	132.82	133.35	133.89	134.42	134.95	135.49	136.02	136.56	137.10
20	139.26	139.81	140.37	140.93	141.49	142.05	142.62	143.18	143.75	144.31
21	146.22	146.80	147.39	147.98	148.57	149.16	149.75	150.34	150.93	151.53
22	153.18	153.79	154.41	155.02	155.64	156.26	156.88	157.50	158.12	158.75
23	160.14	160.78	161.43	162.07	162.72	163.36	164.01	164.66	165.31	165.96
24	167.11	167.77	168.45	169.12	169.79	170.46	171.14	171.82	172.49	173.18
25	174.07	174.76	175.46	176.16	176.86	177.57	178.27	178.98	179.68	180.39
26	181.03	181.76	182.48	183.21	183.94	184.67	185.40	186.14	186.87	187.61
27	188.00	188.75	189.50	190.26	191.01	191.77	192.53	193.30	194.06	194.82
28	194.96	195.74	196.52	197.30	198.09	198.88	199.66	200.45	201.24	202.04
29	201.92	202.73	203.54	204.35	205.16	205.98	206.80	207.61	208.43	209.25
30	208.88	209.72	210.56	211.40	212.24	213.08	213.93	214.77	215.62	216.47
31	215.85	216.71	217.58	218.44	219.31	220.18	221.06	221.93	222.81	223.69

	51	.1	2.	.3	.4	.5	.6	.7	.8	.9
.1	0.72	0.73	0.73	0.73	0.74	0.74	0.74	0.74	0.75	0.75
.2	1.45	1.45	1.46	1.47	1.47	1.48	1.43	1.49	1.49	1.50
.3	2.17	2.18	2.19	2.20	2.21	2.22	2.22	2.23	2.24	2.25
4	2.90	2.91	2.92	2.93	2.94	2.95	2.97	2.98	2.99	3.00
.5	3.62	3.64	3.65	3.66	3.68	3.69	3.71	3.72	3.74	3.75
.6	4.35	4.36	4.30	4.40	4.41	4.43	4.45	4.47	4.48	4.50
.7	5.07	5.09	5.11	5.13	5.15	5.17	5.19	5.21	5.23	5.25
.8	5.79	5.82	5.84	5.86	5.89	5.91	5.93	5.96	5.98	6.00
.9	6.52	6.55	6.57	6.60	6.62	6.65	6.67	6.70	5.72	6.75
Area.	7.24	7.27	7.30	7.33	7.30	7.39	7.42	7.45	7.47	7.50
2	14.49	14.54	14.60	14.66	14.72	14.77	14.83	14.89	14.95	15.00
3	21.73	21.82	21.90	21.99	22.07	22.16	22.25	22.33	22.42	22.51
4	28.98	29.09	29.20	29.32	29.43	29.55	29.66	29.78	29.89	30.01
5	36.22	36.36	36.50	36.65	36.79	36.93	37.08	37.22	37.37	37.51
6	43.46	43.63	43.81	43.98	49.15	44.32	44.49	44.67	44.84	45.01
7	50.71	50.91	51.11	51.31	51.51	51.71	51.91	52.11	52.31	52.51
8	57.95	58.18	58.41	58.64	58.86	59.09	59.32	59.55	59.78	60.02
9	65.20	65.45	65.71	65.97	66.22	66.48	66.74	67.00	67.26	67.52
10	72.44	72.72	73.01	73.29	73.58	73.87	74.15	74.14	74.73	75.02
11	79.68	80.00	80.31	80.62	80.94	81.25	81.57	81.89	82.20	82.52
12	86.93	87.27	87.61	87.95	88.30	88.04	88.99	89.33	89.08	90.02
13	94.17	94.54	94.91	95.28	95.66	96.03	96.40	96.78	97.15	97.53
14	101.42	101.81	102.21	102.61	103.01	103.41	103.82	104.22	104.62	105.03
15	108.66	109.09	109.51	109.94	110.37	110.83	111.23	111.66	112.10	112.53
16	115.90	116.36	116.82	117.27	117.73	118.19	118.65	119.11	119.57	120.03
17	123.15	123.63	124.12	124.00	125.09	125.58	126.06	126.55	127.04	127.53
18	130.39	130.90	131.42	131.93	132.45	132.96	133.48	134.00	134.52	135.04
19	137.64	138.18	138.72	139.26	139.80	140.35	140.89	141.44	141.99	142.54
20	144.88	145.45	146.02	146.59	147.16	147.74	148.31	148.89	149.46	50.04
21	152.12	152.72	153.32	153.92	154.52	155.12	155.73	156.33	156.93	157.54
22	159.37	159.99	160.62	161.25	161.88	102.51	163.12	163.77	164.4	165.04
23	166.61	167.27	167.92	168.58	169.24	169.92	170.56	171.22	171.88	172.55
24	173.86	174.54	175.22	175.91	176.59	177.28	177.97	178.66	179.35	180.05
25	181.10	181.81	182.52	183.24	183.95	184.67	185.39	186.11	186.83	187.55
26	188.34	189.08	189.83	190.57	191.31	192.06	192.80	193.55	194.30	195.05
27	195.59	196.36	197.13	197.90	198.07	199.44	200.22	201.00	201.77	202.55
28	202.83	203.63	204.43	205.23	206.03	206.83	207.63	208.44	209.25	210.06
29	210.08	210.90	211.73	212.56	213.38	214.22	215.05	215.88	216.72	217.56
30	217.32	218.17	219.03	219.88	220.74	221.60	222.46	223.33	224.19	225.06
31	224.56	225.45	226.33	227.21	228.10	228.99	229.88	230.77	231.67	232.56

	52	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.75	0.76	0.76	0.76	0.76	0.77	0.77	0.77	0.78	0.78
.2	1.51	1.51	1.52	1.52	1.53	1.54	1.54	1.55	1.55	1.56
.3	2.26	2.27	2.28	2.29	2.29	2.30	2.31	2.32	2.33	2.34
.4	3.01	3.02	3.04	3.05	3.06	3.07	3.08	3.09	3.11	3.12
.5	3.77	3.78	3.79	3.81	3.82	3.84	3.85	3.87	3.88	3.90
.6	4.52	4.54	4.55	4.57	4.59	4.61	4.62	4.64	4.66	4.68
.7	5.27	5.29	5.31	5.33	5.35	5.37	5.39	5.41	5.42	5.46
.8	6.02	6.05	6.07	6.09	6.12	6.14	6.16	6.19	6.21	6.23
.9	6.78	6.80	6.83	6.86	6.88	6.91	6.93	6.96	6.99	7.01
Area	7.53	7.56	7.59	7.62	7.65	7.68	7.71	7.73	7.76	7.79
2	15.06	15.12	15.18	15.24	15.29	15.35	15.41	15.47	15.53	15.59
3	22.59	22.68	22.77	22.85	22.94	23.03	23.12	23.20	23.29	23.38
4	30.12	30.24	30.36	30.47	30.59	30.71	30.82	30.94	31:06	31.18
5	37.65	37.80	37.94	38.09	38.24	38.38	38.53	38.67	38.82	38.97
6	45.19	45.36	45.53	45.71	45.88	46.06	46.23	46.41	46.5[illegible]	46.75
7	52.72	52.92	53.12	53.33	53.53	53.73	53.94	54.14	54.35	54.56
8	60.25	60.48	60.71	60.94	61.18	61.41	61.65	61.88	62.11	62.35
9	67.78	68.04	68.30	68.56	68.82	69.09	69.35	69.61	69.88	70.14
10	75.31	75.60	75.89	76.18	76.47	76.76	77.06	77.35	77.64	77.94
11	82.84	83.16	83.48	83.80	84.12	84.44	84.76	85.08	85.41	85.72
12	90.37	90.72	91.07	91.42	91.77	92.12	92.47	92.82	93.17	93.53
13	97.90	98.28	98.66	99.03	99.41	99.79	100.17	100.55	100.94	101.32
14	105.43	105.84	105.25	106.65	107.06	107.47	107.88	108.29	108.70	10[illegible].11
15	112.96	113.40	113.83	114.27	114.71	115.15	115.59	116.02	116.47	116.91
16	120.49	120.96	121.42	121.89	122.35	122.82	123.29	123.76	124.22	124.70
17	128.03	128.52	129.01	129.51	130.00	130.50	131.00	131.49	131.99	132.49
18	135.56	136.08	136.60	137.13	137.65	138.17	138.72	139.23	139.76	140.29
19	143.09	143.64	144.19	144.74	145.30	145.85	146.41	146.96	147.52	148.08
20	150.62	151.20	151.78	152.36	152.94	153.53	154.11	154.70	155.29	155.88
21	158.15	158.76	159.37	159.98	160.59	161.20	161.82	162.43	163.05	163.67
22	165.08	166.32	166.96	167.00	188.24	168.66	169.53	170.17	170.82	171.40
23	173.21	173.88	174.55	175.22	175.89	176.56	177.23	177.90	178.58	179.25
24	180.74	181.44	182.14	182.83	183.53	184.23	184.94	185.64	186.35	187.05
25	188.27	189.00	189.72	190.45	191.18	191.91	192.64	193.37	194.11	194.84
26	195.80	196.56	197.31	198.07	198.83	199.59	200.35	201.11	201.87	202.61
27	203.33	204.12	204.90	205.09	206.47	207.20	208.05	208.84	209.64	210.43
28	210.86	211.68	212.49	213.31	214.12	214.94	215.76	216.58	217.40	218.23
29	218.40	219.24	220.08	220.92	221.77	222.62	223.47	224.31	225.17	226.02
30	225.93	226.80	227.67	228.54	229.42	230.29	231.17	232.05	232.93	233.81
31	233.46	234.36	235.26	236.16	237.06	237.97	238.88	239.78	240.70	241.61

	53	1.	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.78	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.81	0.81
.2	1.56	1.57	1.58	1.58	1.59	1.59	1.60	1.61	1.61	1.62
.3	2.35	2.36	2.36	2.37	2.38	2.39	2.40	2.41	2.42	2.43
.4	3.13	3.14	3.15	3.16	3.18	3.19	3.20	3.21	3.22	3.24
.5	3.91	3.93	3.94	3.96	3.97	3.99	4.00	4.02	4.03	4.05
.6	4.69	4.71	4.73	4.75	4.76	4.78	4.80	4.82	4.84	4.85
.7	5.48	5.50	5.52	5.54	5.56	5.58	5.60	5.62	5.64	5.66
.8	6.26	6.28	6.31	6.33	6.35	6.38	6.40	6.42	6.45	6.47
.9	7.04	7.07	7.09	7.12	7.15	7.17	7.20	7.23	7.25	7.28
Area.	7.82	7.85	7.88	7.91	7.94	7.97	8.00	8.03	8.06	8.09
2	15.65	15.71	15.76	15.82	15.88	15.94	16.00	16.00	16.12	16.18
3	23.47	23.56	23.65	23.74	23.83	23.91	24.00	24.09	24.18	24.27
4	31.29	31.41	31.53	31.65	31.77	31.89	32.01	32.13	32.24	32.36
5	39.12	39.26	39.41	39.56	39.71	39.86	40.01	40.16	40.31	40.46
6	46.94	47.12	47.29	47.47	47.65	47.83	48.01	48.19	48.37	48.55
7	54.76	54.97	55.18	55.39	55.59	55.80	56.01	56.22	56.43	56.64
8	62.59	62.82	63.06	63.30	63.53	63.77	64.01	64.25	64.49	64.73
9	70.41	70.68	70.94	71.21	71.48	71.74	72.01	72.28	72.55	72.82
10	78.23	78.53	78.82	79.12	77.42	79.72	80.01	80.31	80.61	80.91
11	86.06	86.38	86.71	87.03	87.36	87.69	88.02	88.35	88.67	89.00
12	93.88	94.23	94.59	94.95	95.30	95.60	96.02	96.38	96.74	97.10
13	101.70	102.09	102.47	102.86	103.24	103.63	104.02	104.41	104.80	105.19
14	109.53	109.94	110.35	110.77	111.19	111.60	112.02	112.44	112.86	113.28
15	117.35	117.79	118.24	118.69	119.13	119.58	120.02	120.47	120.92	121.37
16	125.17	125.65	126.12	126.59	127.07	127.55	128.02	128.50	128.93	129.46
17	133.00	133.50	134.00	134.51	135.01	135.52	136.03	136.53	137.04	137.55
18	140.82	141.35	141.88	142.42	142.95	143.49	144.03	144.56	145.10	145.64
19	148.64	149.20	149.77	150.33	150.90	151.46	152.03	152.60	153.16	153.73
20	156.47	157.06	157.65	158.24	158.84	159.43	160.03	160.63	161.23	161.83
21	164.29	164.91	165.53	166.10	166.78	167.41	168.03	168.66	169.29	169.92
22	172.11	172.76	173.41	174.07	174.72	175.38	176.03	176.69	177.35	178.01
23	179.94	180.62	181.30	181.98	182.66	183.35	184.03	184.72	185.41	186.10
24	187.76	188.47	189.18	189.89	190.61	191.32	192.03	192.75	193.47	194.19
25	195.58	196.32	197.06	197.80	198.55	199.29	200.04	200.78	201.53	202.28
26	203.41	204.18	204.94	205.72	206.49	207.26	208.04	208.82	200.59	210.37
27	211.23	212.03	212.83	213.63	214.43	215.24	216.04	216.05	217.65	218.46
28	219.05	219.88	220.71	221.54	222.37	223.21	224.04	224.88	225.72	226.56
29	226.88	227.73	228.59	229.45	230.31	231.18	232.04	232.91	233.78	234.65
30	234.70	235.59	236.47	237.37	238.26	239.15	240.04	240.94	241.84	242.74
31	242.52	243.44	244.36	245.28	246.20	247.12	248.05	248.97	249.90	250.83

	54	1.	.2	3.	.4	.5	.6	.7	.8	.9
.1	0,81	0.81	0.82	0.82	0.81	0.83	0.83	0.83	0.84	0.84
.2	1.62	1.63	1.64	1.64	1.65	1.65	1.66	1.67	1.67	1.68
.3	2.44	2.45	2.45	2.46	2,47	2.48	2.49	2.50	2.51	2.52
.4	3.25	3.26	3,27	3.28	3.30	3.31	3.32	3.33	3.35	3.36
.5	4.06	4.08	4.09	4.11	4.12	4.14	4.15	4.17	4.18	4.20
.6	4.87	4.89	4.91	4.93	4.94	4.96	4.98	5.00	5.02	5.04
.7	5.68	5.71	5.73	5.71	5.77	5.79	5.81	5,83	5.85	5.88
.8	6.50	6.52	6.54	6,57	6.59	6.62	6.64	6.67	6.69	6.72
.9	7.31	7.34	7.36	7.39	7.42	7.44	7.47	7.50	7.53	7.55
Area.	8.12	8.15	8.18	8.21	8.24	8.27	8.30	8.33	8.36	8.39
2	16.24	16.30	16.36	16.42	16.48	16.54	16.61	16.67	16.73	16.79
3	24.36	24.45	24.54	24.64	24.73	24.82	24.91	25.00	25.05	25.18
4	32.49	32.61	32.73	32.85	32.97	33.09	33.21	33.33	33.45	33.58
5	40.61	40.76	40.91	41.06	41.21	41.36	41.51	41.67	41.82	41.97
6	48.73	48.91	49.09	49.27	49.45	49.63	49.82	50.00	50.18	50.37
7	56.85	57.00	57.27	57.48	57.69	57.91	58.12	58.33	58.55	58.76
8	64.97	65.21	65.45	65.69	65.94	66.18	66.42	66.07	66.91	67.15
9	73.09	73.36	73.63	73.91	74.18	74.45	74.72	75.00	75.27	75.55
10	81.21	81.51	81.82	82.12	82.42	82.72	83.03	83.33	83.64	83.94
11	89.34	89.67	90.00	90.33	90.66	91.00	91.33	91.67	92.00	92.34
12	97.45	97,82	98.18	98.54	98.90	99.27	99.63	100.00	100.37	100.73
13	105.58	105.97	106.36	106.75	107.15	107.54	107.94	108.33	108.73	109.13
14	113.70	114.12	114.54	114.96	115.39	115.81	116.24	116.67	117.05	117.52
15	121.82	122,27	122.72	123.18	123.63	124.09	124.54	125.00	125.46	125.91
16	129.94	130.42	130.91	131.36	131.84	132.36	132.84	133.33	133.82	134.31
17	138.06	138.58	139.09	139.50	140.12	140.63	141.15	141.67	142.18	142.70
18	146.18	146.73	147.27	147.81	148.36	148.90	149.45	150,00	150.55	151.10
19	154.31	154.88	155.45	156.02	156.60	157.18	157.75	158.33	158.91	159.49
20	162.43	163.0	163.63	164.24	164.84	165.45	166.06	166.57	167.27	167.89
21	170.55	171.18	171.81	172.45	173.0	173.72	174.36	175.00	175.64	176.28
22	178.67	179.33	179.99	180.66	181.33	181.99	182.66	183.33	184.00	184.67
23	186.79	187.48	188,18	188.87	189.57	190.26	190.96	191.67	192.37	193.07
24	194.91	195.54	196.36	197.08	197.81	198.54	199.27	200.00	200.73	201.46
25	203.03	203.75	204.54	205.25	206.05	206.8	207.57	208.33	209.09	209.96
26	211.16	211.94	212.72	213.51	214.2	215.08	215.87	216.67	217.46	218.25
27	210.29	220.05	220.90	221.72	222.54	223.35	224,18	225.00	225.82	226.65
28	227.40	228.24	229.08	229.93	230.76	231.63	232.48	233.33	234.19	235.04
29	235.52	236.39	237.27	238.14	239.02	239.90	240.78	241.67	242.55	243.43
30	243.64	244.54	245.45	246.35	247.26	248.17	249.08	250.00	250.91	251.83
31	251.76	252.70	253.63	254.57	255.50	256.44	257.39	258.33	259.28	260.22

	55	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.84	0.85	0.85	0.85	0.85	0.86	0.86	0.86	0.87	0.87
.2	1.68	1.69	1.70	1.70	1.71	1.72	1.72	1.73	1.73	1.74
.3	2.53	2.54	2.55	2.55	2.56	2.57	2.58	2.59	2.60	2.61
.4	3.37	3.38	3.39	3.41	3.42	3.43	3.44	3.46	3.47	3.48
.5	4.21	4.23	4.24	4.26	4.27	4.29	4.30	4.32	4.34	4.35
.6	5.05	5.07	5.09	5.11	5.13	5.15	5.16	5.18	5.20	5.22
.7	5.90	5.92	5.94	5.95	5.98	6.00	6.03	6.05	6.07	6.09
.8	6.74	6.76	6.79	6.81	6.84	6.86	6.89	6.91	6.94	6.96
.9	7.58	7.61	7.64	7.67	7.69	7.72	7.7	7.78	7.80	7.83
Area.	8.42	8.40	8.49	8.52	8.55	8.58	8.61	8.64	8.67	8.70
2	16.85	10.91	10.97	17.03	17.10	17.16	17.22	17.28	17.34	17.41
3	25.27	25.37	25.46	25.55	25.64	25.74	25.83	25.95	26.02	26.11
4	33.70	33.82	33.94	34.07	34.15	34.31	34.44	34.56	34.69	34.81
5	42.12	42.28	42.43	42.59	42.74	42.89	43.05	43.20	43.36	43.51
6	50.55	50.73	50.92	51.10	51.29	51.47	51.66	51.84	52.03	52.22
7	58.97	59.19	59.40	59.62	59.84	60.05	60.27	60.49	60.70	60.92
8	67.40	67.64	67.89	68.14	68.38	68.63	68.88	69.13	69.37	69.62
9	75.82	76.10	76.38	75.65	76.93	77.21	77.49	77.77	78.05	78.33
10	84.25	84.56	84.86	85.17	85,48	85.79	86.10	86.41	86.72	87.03
11	92.67	93.01	93.35	93.69	94.03	94.37	91.71	95.05	95.39	95.73
12	101.01	101.47	101.84	102.20	102.57	102.95	103.32	103.69	104.06	104.43
13	109.52	109.92	110.32	110.72	111.12	111.52	111.93	112.33	12.73	113.14
14	117.95	118.38	118.81	119.24	119.67	120.10	120.54	120.97	21.45	121.84
15	126.37	126.83	127.29	127.75	128.22	28.68	129.15	129.61	130,10	130.54
16	134.80	135.29	135.78	136.27	135.77	137.26	137.75	138.25	138.75	139.25
17	143.22	143.74	144.27	144.79	145.31	145.84	146.36	146.89	147.42	147.95
18	151.65	152.20	152.75	153.31	153.85	154.42	154.97	155.53	156.09	156.65
19	160.07	160.66	161.24	161.82	162.41	63.00	163.58	164.17	164.76	165.35
20	168.50	169.11	169.73	170.34	170.96	171.58	172.19	172.81	173.44	174.06
21	176.02	177.57	178.21	178.86	179.51	180.15	180.80	18 .45	182.11	182.76
22	185.35	186.02	186.70	187.38	188.05	188.73	189.41	190.10	190.78	191.46
23	193.77	194.48	195.18	195.89	196.60	197.31	198.02	198.74	199.45	200.17
24	202.20	202.93	203.67	204.41	205.15	205.89	206.63	207.38	208.12	208.87
25	210.62	211.39	212.16	212.93	2 3.70	214.47	215.24	216.02	216.79	217.57
26	219.05	219.85	220.64	221.41	222.25	223.05	223.85	224.66	225.47	226.28
27	227.47	228.30	229.13	229.96	230.79	231.63	232.46	233.30	234.14	234.98
28	235.90	236.76	237.62	238.48	239.34	240.21	241.07	241.94	242.81	243.68
29	244.32	245.21	246.10	247.00	247.89	248.78	249.68	250,58	251.48	252.38
30	252.75	253.67	254.59	255.51	256.44	257.36	258.29	259.12	260.15	261.09
31	261.17	262.12	263.08	264.03	264.98	265.94	266.90	267.86	268.82	269.57

	56	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.87	0.88	0.88	0.88	0.89	0.89	0.89	0.90	0.90	0.90
.2	1.75	1.75	1.76	1.77	1.77	1.78	1.78	1.79	1.80	1.80
.3	2.62	2.63	2.64	2.65	2.66	2.67	2.68	2.69	2.70	2.70
.4	3.49	3.51	3.52	3.53	3.54	3.56	3.57	3.58	3.59	3.61
.5	4.37	4.38	4.40	4.41	4.43	4.45	4.47	4.48	4.49	4.51
.6	5.24	5.26	5.28	5.30	5.32	5.33	5.35	5.37	5.39	5.41
.7	6.11	6.14	6.16	6.18	6.20	6.22	6.25	6.27	6.29	6.31
.8	6.99	7.01	7.04	7.06	7.09	7.11	7.14	7.16	7.19	7.21
.9	7.86	7.89	7.92	7.94	7.97	8.00	8.03	8.06	8.09	8.12
Area.	8.73	8.77	8.80	8.83	8.86	8.80	8.92	8.95	8.99	0.02
2	17.47	17.53	17.59	17.66	17.72	17.78	17.84	17,91	17.57	18.0
3	26.20	26.30	26.39	26.48	26.58	26.57	26.77	26.86	26.9	27.05
4	34.94	35.05	35.10	35.31	35.44	35.56	35.69	35.81	35.94	36.07
5	43.67	43.83	43.98	44.14	44.30	44.45	44.61	44.77	44.93	45.09
6	52.40	52.59	52.78	52.97	53.16	53.34	53.53	53.72	53.91	54.10
7	61.14	61.30	61.53	61.80	62.01	62.23	62.40	62.68	62.90	63.12
8	69.87	70.12	70.37	70.62	70.87	71.13	71.38	71.63	71.88	72.14
9	78.61	78.89	79.17	79.45	79.73	80.02	80.30	80.58	80.87	81.15
10	87.34	87.65	87.97	88.28	88.59	88.91	89,22	89.54	89.85	90.17
11	96.07	06.42	96.76	97.11	97.45	97.80	98.11	08.51	08.8	99.19
12	104.81	185.18	105.50	105.93	106.21	100.69	107.07	107 4	107.82	108.2
13	113.54	113.95	114.36	114.76	115.17	115.58	115.97	116.40	116.81	117.22
14	122.28	122.71	123.15	123.59	124.03	124.47	124.91	125.35	125.80	126.24
15	131.01	131.48	131.95	132.12	132.89	133 36	133.83	134.31	134.75	135.2
16	139.75	140.24	140.75	141.25	141.75	142.25	142.75	143.26	143.77	144.27
17	148.48	149.01	149.54	150.07	150.01	151.14	151.68	152.21	152.75	153.29
18	157.21	157.78	158.3	158.90	159.47	160.03	100.60	161.17	161.74	162.31
19	165.95	166.54	167.14	107.73	168.33	168.62	169.52	170.12	170.72	171.32
20	174.68	175.31	175.92	176.56	177.19	177.81	178.44	179.08	179.71	180.34
21	183.42	184.07	184.73	185.39	186.01	186.70	176.37	188.03	188 69	189.35
22	192.15	192.84	193.52	194.21	194.50	195.00	196.25	196.98	197.68	198.38
23	200.85	201.60	202.32	203.04	203.76	204.49	205.21	205.94	206.66	207 35
24	209.62	210.37	211.12	211.87	212.62	213.38	214.13	214.89	215.6	216.41
25	218.35	219.13	219.91	220.70	221.48	222.27	223.05	223.84	224.63	225.43
26	227.09	227.90	228.71	229.53	230.34	231.16	231.98	232.80	232.62	234.4
27	235.82	236.60	237.51	238.35	239.20	240.0	240.90	241.75	242.61	243.4
28	244.55	245.43	246.30	247.18	248.05	248.93	249.8.	250.71	251.59	252.48
29	253.29	254.19	255.10	256.01	257.06	257.8	258.7	259.66	260.58	261.50
30	262.02	251.96	263.50	264.84	265.78	266.72	267.67	268.61	269.56	270.51
31	270.76	271.72	272.69	273.66	274.64	275.61	276.55	277.57	278.55	279.53

	57	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.90	0.91	0.91	0.91	0.92	0.9	0.92	0.93	0.93	0 93
.2	1.81	1.82	1.82	1.83	1.83	1.84	1.85	1.85	1.86	2.87
.3	2.71	2.72	2.7	2.74	2.74	2.76	2.77	2.78	2.7	1.80
.4	3.52	3.63	3.64	3.66	3.67	3.68	3.70	3.71	3.72	3.73
.5	4.52	4.54	4.56	4.57	4.5	4.60	4.62	4.64	4.65	4.67
.6	5.43	5.45	5.47	5.49	5.51	5.52	5.54	5.56	5.58	5.60
.7	6.33	6.36	6.38	6.40	6.42	6.45	6.47	6.49	6.51	6.54
.8	7.24	7.26	7.29	7.32	7.34	7.37	7.39	7.42	7.44	7.47
.9	8.14	8.17	8.20	8.2	8.2	8.29	8.32	8.34	8.37	8.40
Area	9.05	9.08	9.11	9.14	9.18	9.21	9.24	9.27	9.30	9.34
2	18.10	18.16	18.22	18.29	18.35	18.42	18.48	18.54	18.61	18.67
3	27.15	27.24	27.34	27.43	27.53	27.62	27.72	27.82	27 91	28.01
4	36.19	36.32	36.45	36.5	36.70	36.83	36.96	37.09	37.22	37.35
5	45.24	45 40	45.56	45.72	45.88	46.04	46.2	46.36	46.52	46.68
6	54.29	5 .48	54.6	54.87	55.0	55.25	55.44	55 63	55.83	56.02
7	63.34	63.56	63.7	64.01	64.23	64.46	64 68	64 91	65 13	65.36
8	72.39	72.64	72.90	73.15	73.41	73.67	73.92	74.18	74.44	74.71
9	81.44	81.73	82.01	82.30	82.59	82.87	83.1	83.45	83 74	84.03
10	90.49	90.81	91.12	91.44	91.76	92.08	92.40	92.72	93.05	93 37
11	99.54	99.89	100.2	00.59	100.94	101.2	101.6	102.00	102.35	102.70
12	108.59	108.97	109.35	109 73	110.11	110.50	110.88	111.27	111.65	112.04
13	117.63	118.05	118.46	118.88	119.29	119 71	120.12	120.54	120.96	121.38
14	126.68	127.13	127.57	128.02	128.47	28.91	129.36	129.81	130.26	130.71
15	135.73	135.21	136.67	137.16	137.64	138.12	138.60	139.09	139.57	140.05
16	144.78	145.29	145.8	14 .31	146.82	147.33	147.84	148.36	148.87	149.39
17	153.83	154.37	154.91	155.45	156.00	156.54	157.09	157.63	158.18	158.73
18	162.88	163.45	164.02	16 .60	165.17	165.75	166 33	166.90	167.48	168.06
19	171.93	172.5	17 .14	173.74	174.35	174.96	175.57	176.18	176.79	177.40
20	180.93	181.51	182.25	182.87	183.5	184.16	184.81	185 45	185.09	186.74
21	190.02	190.69	91.36	192.03	19 .70	193.37	194.05	194.72	195.40	96.07
22	199.07	199.77	200.47	201.17	20 .88	202.58	203 29	203.99	204.70	205.41
23	208.12	208.85	209.58	210.32	211.05	211.79	212.53	213.27	214.01	214.75
24	217.17	217.93	218.70	219.46	220.23	221.00	221.77	222.54	223.31	224.08
25	226.22	227.01	227.81	228.61	229.40	230.21	231.01	231.81	232.61	233.42
26	235.27	235.10	236.0	237.75	238.5	239.41	240.2	241.08	241.92	212.76
27	244.32	245.1	246.08	246.90	247.76	248.62	249.49	250.35	251.22	252.09
28	253.37	254 25	25 .15	256.04	256.93	257.83	258.73	259.63	260.53	261.43
29	262.41	263.3	264.25	265. 8	266.11	267.04	267.97	268.90	269.8	270.77
30	271.46	272.42	273.31	274.33	275.29	276.25	277.21	278.17	279.14	280.10
31	280.51	281.50	282.48	283.47	284.4	285.45	286.45	287.44	288.44	289.44

	58	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	0.94	0.94	0.94	0.95	0.95	0.95	0.96	0.96	0.96	0.97
.2	1.87	1·88	1.89	1.89	1.90	1.91	1.91	1.92	1.93	1.93
.3	2.81	2.82	2.83	2.84	2.85	2.86	2.87	2.88	2.89	2.90
.4	3.75	3.76	3.77	3.79	3.80	3.81	3.83	3.84	3.85	3.86
.5	4.68	4.70	4.72	4.73	4.75	4.77	4.78	4.80	4.81	4.83
.6	5.62	5.64	5.66	5.68	5.70	5.72	5.74	5.76	5.78	5.80
.7	6.56	6.58	6.60	6.63	6.65	6.67	6.69	6.72	6.74	6.76
.8	7.50	7.52	7.55	7.57	7.60	7.62	7.65	7.68	7.70	7.73
.9	8.43	8.46	8.49	8.52	8.55	8.58	8.61	8.64	8.67	8.70
Area	9.37	9.40	9.43	9.47	9.50	9.53	9.56	9.60	9.63	6.66
2	18.74	18.80	18.87	18.93	19.00	19.06	19.13	19.19	19.20	19.32
3	28.11	28.20	28.30	28.40	28.50	28.59	28.69	28.79	28.89	28.99
4	37.48	37.61	37.73	37.86	37.99	38.12	38.26	38.39	38.52	38.65
5	56.85	47.01	47.17	47.33	47.49	47.66	47.82	47.98	48.15	48.31
6	56.21	56.41	56.60	56.80	56.99	57.19	57.38	57.58	57.78	57.97
7	65.58	65.81	66.04	66.26	66.49	66.72	66.95	67.18	67.40	67.63
8	74.95	75.21	75.47	75.73	75.99	76.25	76.51	76.77	77.03	77.30
9	84.32	84.61	84.90	85.20	85.49	85.78	86.07	86.37	86.66	86.96
10	93.69	94.01	94.34	94.66	94.99	95.31	95.64	95.97	96.31	96.62
11	103.06	103.42	103.77	104.13	104.49	104.84	105.20	105.56	105.92	106.28
12	112.43	112.82	113.21	113.59	113.99	114.38	114.77	115.16	115.55	115.94
13	121.80	122.22	122.64	123.06	123.48	123.91	124.33	124.76	125.18	125.61
14	131.17	131.62	132.07	132.53	132.98	133.44	133.89	134.35	134.81	135.27
15	140.54	141.02	141.51	141.99	142.48	142.97	143.46	143.95	144.44	144.93
16	159.91	150.42	150.94	151.46	151.98	152.50	153.02	153.55	154.07	154.55
17	149.27	159.82	160.37	160.93	161.48	162.03	162.59	163.14	163.70	164.26
18	168.64	169.22	169.81	170.39	170.98	171.56	172.15	172.74	173.33	173.92
19	178.01	178.63	179.24	179.86	180.48	181.09	181.71	182.34	182.96	183.58
20	187.38	188.03	188.68	189.32	189.98	190.63	191.28	191.93	192.59	193.24
21	196.75	197.43	198.11	198.79	199.47	200.16	200.84	201.53	202.22	202.90
22	206.12	206.83	207.54	208.26	208.97	209.69	210.41	211.12	211.84	212.57
23	215.49	216.23	216.98	217.72	218.47	219.22	219.98	220.72	221.47	222.23
24	224.86	225.63	226.41	227.19	227.97	228.75	229.53	230.32	231.10	231.89
25	234.23	235.03	235.84	236.65	237.47	238.28	239.10	239.91	240.73	241.55
26	243.60	244.44	245.28	246.12	246.97	247.81	248.66	249.51	250.36	251.21
27	252.97	253.84	254.71	255.59	256.47	257.34	258.23	259.11	259.99	260.83
28	262.33	263.24	264.15	265.05	265.97	266.88	267.79	268.70	269.62	270.54
29	271.70	272.64	273.58	274.52	275.46	276.41	277.35	278.30	279.25	280.20
30	281.07	282.04	283.01	283.99	284.96	285.94	286.92	287.90	288.88	289.86
31	290.44	291.44	292.45	293.44	294.46	295.47	296.48	297.49	298.51	299.5

	59	1.	.2	.3	.4	.5	.6	.7	.8	.9
.1	0.97	0.97	0.98	0.98	0.98	0.99	0.99	0.99	1.00	1.00
.2	1.94	1.95	1.95	1.96	1.97	1.97	1.98	1.99	1.99	2.00
.3	2.91	2.92	2.93	2.94	2.95	2.96	2.97	2.98	2.99	3.00
.4	3.88	3.89	3.90	3.92	3.93	3.94	3.96	3.97	3.98	4.00
.5	4.85	4.86	4.88	4.90	4.91	4.93	4.95	4.96	4.98	5.00
.6	5.82	5.84	5.86	5.88	5.90	5.92	5.94	5.96	5.98	6.00
.7	6.79	6.81	6.83	6.86	6.88	6.90	6.92	6.95	6.97	6.99
.8	7.76	7.78	7.81	7.83	7.86	7.89	7.91	7.94	7.97	7.99
.9	8.73	8.75	8.78	8.81	8.84	8.87	8.90	8.93	8.96	8.99
Area	9.69	9.73	9.76	9.79	9.83	9.86	9.89	9.93	9.96	9.99
2	19.39	19.46	19.52	19.59	19.65	19.72	19.79	19.85	19.92	19.99
3	29.08	29.18	29.28	29.38	29.48	29.58	29.68	29.78	29.88	29.98
4	38.78	38.91	39.04	39.17	39.31	39.44	39.57	39.70	39.84	39.97
5	48.47	48.54	48.80	48.97	49.13	49.30	49.47	49.63	49.80	49.96
6	58.17	58.37	58.56	58.76	58.96	59.16	59.36	59.56	59.76	59.96
7	67.86	68.09	68.33	68.56	68.79	69.02	69.25	69.48	69.72	69.95
8	77.56	77.82	78.09	78.35	78.61	78.88	79.14	79.41	79.68	79.94
9	87.25	97.55	87.85	88.14	88.44	88.74	89.04	89.34	89.64	89.94
10	96.95	97.28	97.61	97.94	98.27	98.60	98.93	99.26	99.60	99.93
11	106.64	107.01	107.37	107.73	108.09	108.46	108.82	109.19	109.56	109.92
12	116.34	116.73	117.13	117.53	117.92	118.32	118.72	119.12	119.52	119.92
13	126.03	126.46	126.89	127.32	127.75	128.18	128.61	129.04	129.48	129.91
14	135.73	136.19	136.65	137.11	137.57	138.04	138.50	138.97	139.43	139.90
15	145.42	145.92	146.41	146.91	147.40	147.90	148.40	148.89	149.39	149.89
16	155.12	155.64	156.17	156.70	157.23	157.76	158.29	158.82	159.35	159.89
17	164.81	165.37	165.93	166.49	167.06	167.62	168.18	168.75	169.31	169.88
18	174.51	174.10	175.69	176.29	176.88	177.48	178.08	178.67	179.27	179.87
19	184.20	184.83	185.45	186.08	186.71	187.34	187.97	188.60	189.23	189.87
20	193.90	194.56	195.22	195.88	196.54	197.20	197.86	198.53	199.19	199.86
21	203.59	204.28	204.98	205.67	206.36	207.06	207.73	208.45	209.15	209.85
22	213.29	214.01	214.74	215.46	216.19	216.92	217.65	218.38	219.11	219.85
23	222.98	223.74	224.50	225.26	226.02	226.78	227.54	228.30	229.07	229.84
24	232.68	233.47	234.26	235.05	235.84	236.64	237.43	238.23	239.03	239.83
25	242.37	243.19	244.02	244.84	245.67	246.50	247.33	248.16	248.99	249.82
26	252.07	252.92	253.78	254.64	255.50	256.36	257.22	258.08	258.95	259.82
27	261.76	262.65	263.54	264.43	265.32	266.22	267.11	268.01	268.91	269.81
28	271.45	272.38	273.30	274.23	275.15	276.08	277.01	277.94	278.87	279.80
29	281.15	282.11	283.06	284.02	284.98	285.94	286.90	287.86	288.83	289.90
30	290.85	291.83	292.82	293.81	294.81	295.80	296.79	297.79	298.79	299.79
31	300.54	301.56	302.58	303.61	304.63	305.66	306.69	307.72	308.75	309.78

	60	1.	2.	3.	4.	5.	6.	7.	8.	9.
.1	1.00	1.01	1.01	1.01	1.02	1.02	1.02	1.03	1.03	1.03
.2	2.01	2.01	2.02	2.03	2.03	2.04	2.05	2.05	2.06	2.07
.3	3.01	3.02	3.03	3.04	3.05	3.06	3.07	3.08	3.09	3.10
.4	4.01	4.02	4.04	4.05	4.06	4.08	4.09	4.10	4.12	4.13
.5	5.01	5.03	5.05	5.06	5.08	5.10	5.11	5.13	5.15	5.16
.6	6.02	6.04	6.06	6.08	6.10	6.12	6.14	6.16	6.18	6.20
.7	7.02	7.04	7.07	7.09	7.11	7.14	7.16	7.18	7.21	7.23
.8	8.02	8.05	8.07	8.10	8.13	8.16	8.18	8.21	8.24	8.26
.9	9.02	9.05	9.08	9.11	9.14	9.17	9.20	9.24	9.27	9.29
Area.	10.03	10.06	10.09	10.13	10.16	10.19	10.23	10.26	10.30	10.33
2	20.05	20.12	20.19	20.25	20.32	20.39	20.46	20.52	20.59	20.66
3	30.08	30.18	30.28	30.38	30.48	30.58	30.68	30.78	30.89	30.99
4	40.11	40.24	40.37	40.51	40.64	40.78	40.91	41.05	41.18	41.32
5	50.13	50.30	50.47	50.63	50.80	50.97	51.14	51.31	51.48	51.65
6	60.16	60.36	60.55	60.76	61.02	61.17	61.37	61.57	61.77	61.98
7	70.18	70.42	70.65	70.89	71.12	71.36	71.60	71.83	72.07	72.31
8	80.21	80.48	80.75	81.01	81.28	81.55	81.82	82.09	82.36	82.54
9	90.24	90.54	90.84	91.14	91.44	91.75	92.05	92.35	92.66	92.96
10	100.26	100.60	100.93	101.27	101.60	101.94	102.28	102.62	102.95	103.29
11	110.29	110.66	111.03	111.40	111.77	112.14	112.51	112.88	113.25	113.62
12	120.32	120.72	121.12	121.52	121.93	122.33	122.73	123.14	123.55	123.95
13	130.34	130.78	131.21	131.65	132.09	132.52	132.96	133.40	133.84	134.28
14	140.37	140.84	141.31	141.78	142.25	142.72	143.19	143.66	144.14	144.61
15	150.40	150.90	151.40	151.90	152.41	152.94	153.42	153.93	154.43	154.94
16	160.42	160.96	161.49	162.03	162.57	163.11	163.65	164.19	164.73	165.27
17	170.45	171.02	171.59	172.16	172.73	173.30	173.87	174.45	175.02	175.60
18	180.47	181.08	181.68	182.28	182.89	183.50	184.10	184.71	185.32	185.93
19	190.50	191.14	191.77	192.41	193.05	193.69	194.33	194.97	195.61	196.26
20	200.53	201.20	201.87	202.54	203.21	203.88	204.56	205.23	205.91	206.59
21	210.55	211.26	211.96	212.66	213.37	214.08	214.79	215.50	216.21	216.92
22	220.58	221.32	222.05	222.79	223.53	224.27	225.11	225.76	226.50	227,25
23	230.61	231.38	232.15	232.92	233.69	234.47	235.24	236.02	236.80	237.58
24	240.63	241.43	242.24	243.05	243.85	244.66	245.47	246.28	247.09	247.91
25	250.66	251.49	252.33	253.17	254.01	254.85	255.70	256.54	257.39	258.24
26	260.69	261.55	262.43	263.30	264.17	265.05	265.93	266.80	267.68	268.56
27	270.71	271.61	272.52	273.43	274.33	275.24	276.15	277.07	277.98	278.89
28	280.74	281.67	282.61	283.55	284.49	285.44	286.38	287.33	288.27	289.22
29	290.77	291.73	292.71	293.68	294.65	295.63	296.51	297.59	298.57	299.55
30	300.79	301.79	302.08	303.81	304.81	305.83	306.84	307.85	308.86	309.88
31	310.82	311.85	312.89	313.93	314.98	316.02	317.06	318.11	319.16	320.21

FINIS.

29 JA63

THE ELEMENTS OF GAUGING:

OR,

A Solution of all the Neceſſary
PROBLEMS in Gauging;
Together with the
REASONS of Them
Geometrically Demonſtrated:
As a SUPPLEMENT to Mr. *Ward's*
Gauger's Practice.

By *James Lightbody*, P. M.

LONDON,
Printed for **Robert Battersby**, at *Staple-Inn-Gate*, next the Bars, in *Holborn*, 1704.

BRITISH MUSEUM

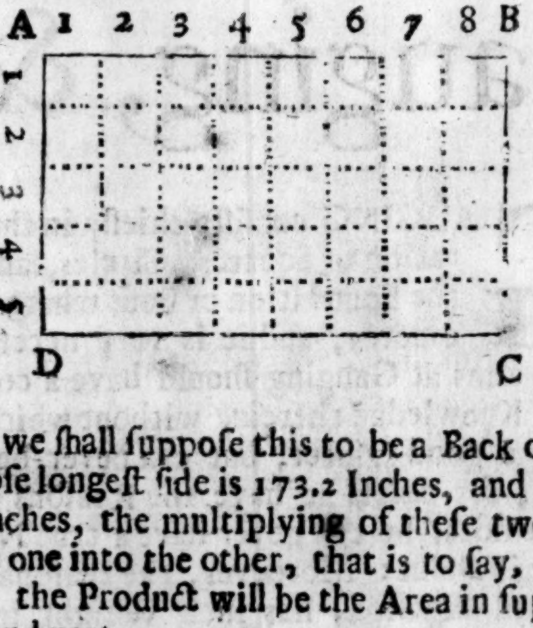
B

THE ELEMENTS OF Gauging, &c.

GAUGING conſiſts chiefly in the Menſuration of Squares, Circles, and Ovals, the Foundation or Baſis whereof is Geometry, and it is very neceſſary that he who aims at Gauging ſhould have a competent ſhare of Knowledge therein, without which a Man may be a good Officer, but can never be a good Gauger; for unleſs he have the Reaſons of every thing he does, he can never have a true Notion of what he is about: Moreover, the reaſonable part being well digeſted, has ſuch Weight in it ſelf, that nothing can root it out of a Man's Thoughts; and upon any occaſion, he is not only able to work any Queſtion put to him, more readily than without it, but to diſcourſe the ſame with greater Judgment than he who wants ſo neceſſary an Accompliſhment.

Of a Geometrical Square.

A Geometrical Square is a Figure produced from the Multiplication of two right Lines one into the other, as if the two right Lines A B and A D be multiplied one into the other, thereof is made the Quadrangle A B C D. If then A B be five Foot and A D eight, the whole Quadrangle ſhall be 40 ſquare Feet, as appeareth by the prick'd Lines in the Diagram.



Now we ſhall ſuppoſe this to be a Back or Cooler, whoſe longeſt ſide is 173.2 Inches, and ſhorteſt 124.5 Inches, the multiplying of theſe two Numbers the one into the other, that is to ſay, A B into A D, the Product will be the Area in ſuperficial Inches and parts.

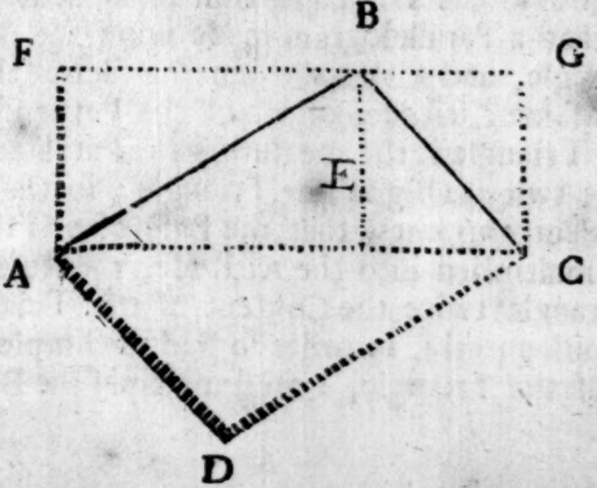
Then to find its Content in Ale or Wine Gallons, you muſt find the Area in Gallons, that is, how many Gallons it holds upon one Inch deep in Liquor, by dividing the Sum of ſuperficial Inches by the number of ſolid Inches contained in an Ale or Wine Gallon, *viz.* 282, or 231.

Queſt. What is the Reaſon that the dividing by 282 or 231 produces the Area in Ale or Wine Gallons?

Anſw. 282 and 231 are the number of Inches contained in an Ale or Wine Gallon, according to the Statute: Therefore when you have found how many Inches in Superficie any Cooler contains, and knowing that 282 ſquare or ſolid Inches is in a Gallon of Beer or Ale, you are obliged by the common Rules of Arithmetick, to know how often 282 is in the number of Inches found; which ſhews you how many Gallons are contained in the whole number of ſuperficial Inches. For 282, the number of Inches in a Gallon of Ale, may be compared to 20, the number of Shillings in a Pound; for if you have 3567 Shillings, you muſt divide that number by 20, to know how many Pounds is therein.

Of TRIANGLES.

LET a Triangle be right Angled, Oblique, or Acute, I ſay, which ſoever of theſe it be, it is always equal to the half of a Square or Oblong, having two ſides equal to the Baſe, and Perpendicular of the ſame Triangle, as by the following Figure will plainly appear.



Let A B C be a Triangle, whoſe Baſe A C is 460, and Perpendicular E is 370, the Content in ſuperficial Inches of this Triangle is 170200, which is equal to the half of A B C D, or F G C A; for if the Triangle A F B be 100000, B G C will be 70200.

Therefore, ſince you multiply the one ſide of a Quadrangle or Square by the other, to find the ſuperficial Content, you are by Reaſon obliged to multiply the half of the one ſide by the whole of the other, to find the ſuperficial Content of a Triangle, it being the half of a Quadrangle.

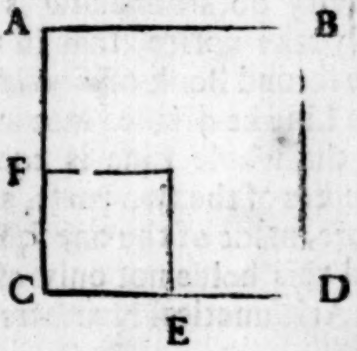
The demonſtrative Account of this Doctrine is grounded upon the 34 and 41. Propoſition of the firſt Book of *Euclid*. In the firſt it is taught and demonſtrated, that the Diagonal of a Parallelogram divides the whole into two equal Triangles, and conſequently that the whole Parallelogram is equal to two Triangles, contained betwixt the parallel ſides and the Diagonal: And this holds not only as to Rectangular Squares, but as to all Parallelograms.

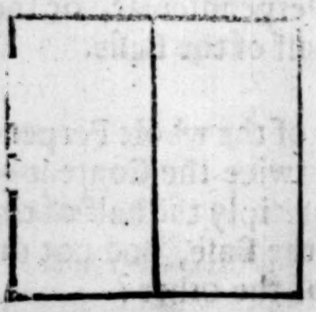
Beſides in the 41. Propoſition it is demonſtrated, that a Parallelogram made upon the Baſis of a Triangle, and within the ſame Parallels, (that is, of the ſame Altitude, of which the Perpendicular of the Triangle is the meaſure,) the Parallelogram ſhall be twice as big as the Triangle; ſo that here it evidently appears, that the Baſe of a Triangle being multiplied into the Altitude, the Reſult is a Quadrangle twice the Content of the Triangle; and conſequently, in order to find the ſimple Content of the Triangle, I muſt multiply the Baſe by the half of the Altitude or Perpendicular, or the whole Perpendicular by the half of the Baſis.

Queſt. Since a Square made of the whole Perpendicular and the whole Baſe, is twice the Content of the Triangle, why do not I multiply the half of the Perpendicular by the half of the Baſe, and not the whole of the one by the half of the other?

Anſw. If I multiplied only the half of the one by the half of the other, inſtead of finding the half Content of the Square, which is equal to that of the Triangle, I ſhould find but a fourth part of it, as by the following Figure appears.

The Reaſon of this is, becauſe the Proportion betwixt two Squares is not the ſame as betwixt two Roots: As for Example, tho' 4 be the half of 8, yet the Square of the firſt, *viz.* 16, is but the fourth part of the Square of 8, *viz.* 64. In like manner, tho' 10 Foot be the half of 20, yet a Superficie of 10 Foot ſquare is but the fourth part of another of 20 Foot ſquare, as ſuppoſe A D to be twenty Foot ſquare, take off 10 Foot of the Baſe C D, which is C E, and 10 Foot of the Altitude C F, this ſquared, makes but the fourth part of the whole A B D C, ſo that it is evident, that to find out the half of a Square, I muſt multiply the whole of one ſide by the half of the other:





other: As for Example, the Parallelogram deſcribed upon the whole ſide, and half of the ſide, makes a Quadrangle equal to the half of the whole Square; as by the annexed Figure doth appear: From all which we may eaſily conclude, that ſince a Quadrangle made upon the Baſis and Altitude of a Triangle, is the double of the Triangle, then the ſimple Content of the Triangle is repreſented by a Quadrangle, made upon the whole Altitude, and half of the Baſe; and *Vice Verſâ*, or (which is the ſame thing) multiplying the whole Altitude or Perpendicular by half the Baſe, and *è contra*, you have the ſuperficial Content of the Triangle.

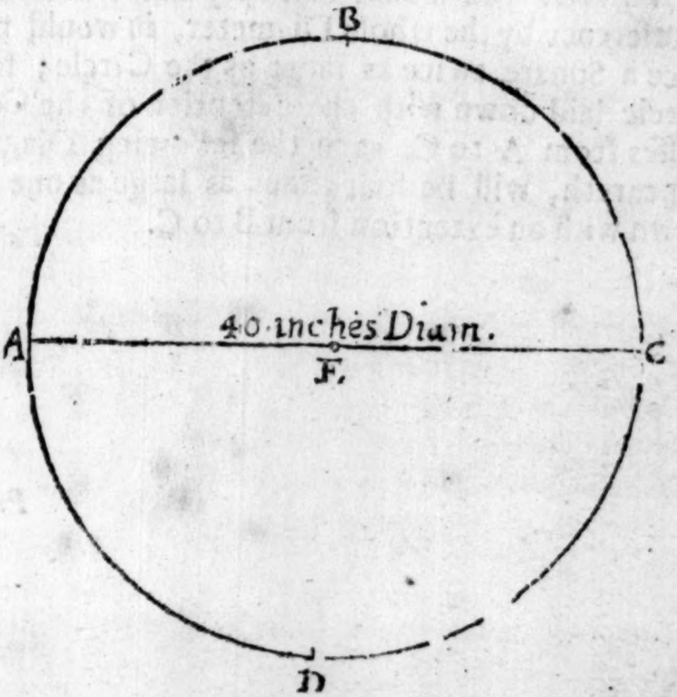
The perfecter Account of this Proportion betwixt a Square and its Root, is only drawn from the Doctrine of Proportions, which tho' it be highly pleaſant and ſatisfactory in it ſelf, yet our limited brevity does not allow us here to inſert. We ſhall only take notice, that in the fourth Propoſition of the ſecond Book of *Euclid*, it is demonſtrated, that if a Line be divided into any two parts, the Square of the whole Line is equal to the two ſeparate Squares of the two parts; and beſides, to two Squares more, made of the one ſquared by the other twice; and this holds not only of Geometrical Lines, but of Arithmetical Numbers.

As for Example, 7 is an entire Number, of which the Square is 49, ſuppoſe the Root 7 be divided into two parts, 3 and 4, the Square of 3 is 9, and the Square of 4 is 16, the Sum whereof is 25, which is far ſhort of the Square of 7, *viz.* 49, ſo that to make it up the one Number muſt be multiplied into the other twice, *viz.* 3 into 4, which makes twice 12, or 24, now 24 being added to the firſt Square 25, makes up 49.

Note, That multiplying the Perpendicular into the Baſe is the ſame thing as making a Quadrangle of the Perpendicular and Baſe.

Of a Circle.

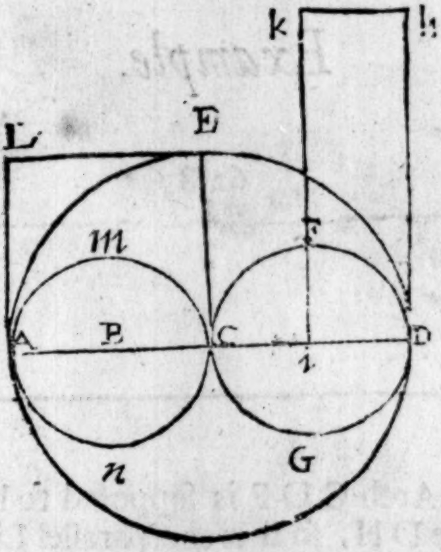
A Circle is chiefly applied to Cask-Gauging, but before I apply it I ſhall firſt ſhew you why the Content of it is found by the Rule directed.



All Artiſts allow, that the multiplying half the Circumference by half the Diameter, produces the ſuperficial Content in Inches, but why it does ſo is left to the Ingenuous: We ſhall ſuppoſe the Diameter of this Circle to be 40 Inches, and Circumference to be 125.6, the half of 40 is 20, and the half of 125.6 is 62.8, the Product of theſe two multiplied into each other is 1256.0, the Content of the Circle.

Queſt. What is the Reaſon you multiply half the Diameter by half the Circumference, and does not multiply the whole of the one by the whole of the other, to find the ſuperficial Content?

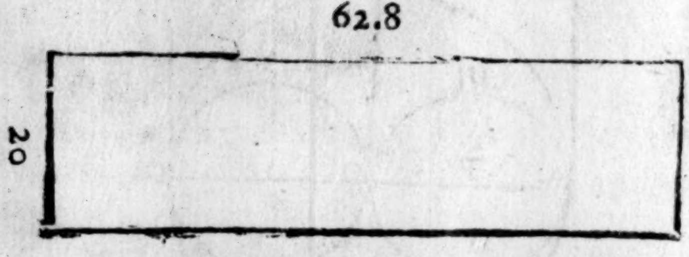
Anſw. If you ſhould multiply the whole Circumference by the whole Diameter, it would produce a Square twice as large as the Circle; for a Circle laid down with the extention of the Compaſſes from A to C, as in the following Diagram appeareth, will be four times as large as one laid down with an extention from B to C.



Proof. Suppoſe the Diameter of the Circle A B C be 40 Inches, and Circumference 125.6 Inches, the Product of the half of the one multiplied into the half of the other is 1256.0 Inches, which is equal to the Quadrant A C E of the large Circle, and is leſs by almoſt $\frac{1}{4}$ than the Square made of the Diameter of A B C.

Now ſuppoſe the Semi-diameter of C D F G to be 20, the half of the Circumference C F D to be 62.8, if you lay down an Oblong, whoſe longeſt ſide is 62.8, and ſhorteſt ſide 20, the ſquare Inches therein will be equal to 1256.0, the Content of the Circle C F D G.

Example.



For the Arch C D F is ſuppoſed to be extended as the Line D H, ſo that the parallel Lines I K and K H makes up the Oblong; for as H D is equal to C F D, ſo is I K equal to CGD, and ſo is I D to its parallel equal.

Now, if I were to meaſure the Content of this Oblong I D H K, (which is ſuppoſed equal to the Circle C F D G) the vulgar way to perform it is to multiply one of the long ſides by one of the ſhorter, as I K by I D, but I D is ſuppoſed equal to the Radius or Semi-diameter of the Circle, and I K equal to the half of the Circumference; ſo that if in the Menſuration of Circles we went about to multiply the whole Diameter by the whole Circumference, it would be as abſurd, as if, in order to find out the Content of a Square, we multiplied all the four ſides into one another, for what Proportion two ſides of a Square have to the whole Square, the ſame Proportion have the half of the Circumference, and the half of the Diameter to the whole Circle.

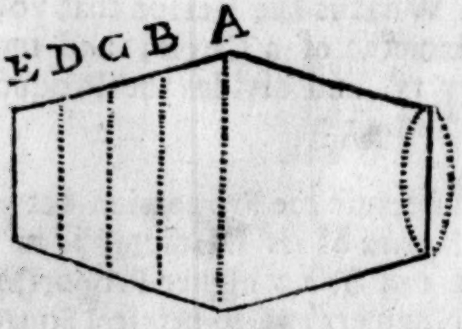
Queſt. What is the Reaſon that you ſquare the mean Diameter of a Circle, and multiplies the Square by 11, and divides the Product by 14, to find the Content?

Anſw. Becauſe the Proportion between a Circle and the Square of its Diameter is as 11 is to 14, for there can be no nigher Proportion found (in integral Numbers) a Geometrical Square, as LECA, whoſe ſides are all equal to the Diameter of the Circle A M C N, will be greater than the Circle by ALE. Therefore the difference between a Square and a Circle correſponds to the difference betwixt 11 and 14.

The foregoing Demonſtrations are enough, if well obſerved, to make a Man able to Gauge any Veſſel, for the whole Art of Gauging is grounded thereupon; but I ſhall now proceed to the uſe of Circles in Cask Gauging.

Of Cask Gauging.

LET a Cask be of what form ſoever, it muſt be reduced into a Cylinder, that is, a Solid, whoſe Circumference is equal in all parts; as ſuppoſe it were a Cask in form as the Figure following, *viz. The Fruſtum of two Cones abutting upon a common Baſe.*



All the way between the Bung and Head is ſuppoſed to be nothing but Circles, as if it were ſo many points as could be ſet down touching each other, which at laſt makes an individual Line; for as a point is ſuppoſed indiviſible, a number of them touching each other makes an entire Line.

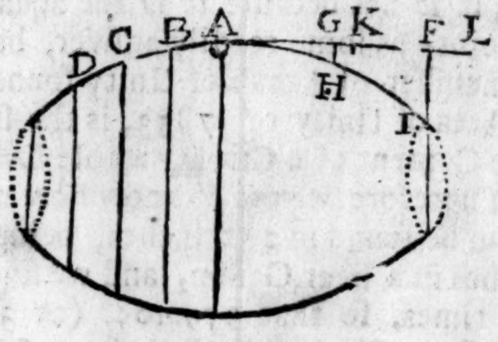
Now having the Diameter at A and likewiſe at E, take half the Sum, and you have the Diameter at C, ſo likewiſe if you have the Diameters at C and E, the half of the Sum is the Diameter at D; ſo that C is certainly the mean Diameter of ABCDE, and conſequently the Cask is reduced into a mean Circle or Cylinder, the which being ſquared, and the Square divided by the proper Diviſor for Ale or Wine, you have the Area, or what it holds upon one Inch.

Queſt. Why is 359.105 a proper Diviſor to divide the Square of a Diameter by, to find the Area for Ale?

Anſw. It is not becauſe it is the Square of the Gauge-point, as ſome readily anſwer, but becauſe it is the number of Area's of Unity found in 282. For the Area of Unity or .7853, is the ſuperficial or ſquare Content of a Circle, whoſe Diameter is 1 Inch. Therefore we are to know how many ſuch Area's can be found in 282 Inches, being the Cubical Inches in a Beer Gallon, and we find it to be 359.105 times, ſo that 359.105, (or 359 only) is proper for a Circle, as 282 is for a Square, for if 282 be the number of ſquare Inches in a Gallon, 359.105 is the number of Circles, whoſe Diameter is one Inch, contained in a Gallon of Beer or Ale.

Of Gauging the middle Fruſtum of a Spheroid.

AS I have ſet forth in that of Conoids before mentioned, you are to conceive this Cask to be ſo many Circles, as indiviſible points may ſtand between End and End, but by reaſon that from Bung to Head either way is equal, we ſhall only ſuppoſe it to be the double of one end.



Now ſuppoſe your Diameter at A to be 35, the Diameter at B muſt be leſs, for according to *Euclid*, *Lib.* 3. *Prop.* 13. a leſſer Circle within a greater can touch the greater but in one point, therefore you are to ſuppoſe the Line A E reduces the Cask to the Fruſtums of Conoids, and the Segment A B C D E to be found according to the Problems of Geometry too large here to inſert, my aim here being only to ſhew the Baſis and reaſonable part of Gauging.

Queſt. What is the Reaſon that the Sum of the double Square of the Bung and Square of the Head multiplied by the length and divided by 1077. gives the Content of the Fruſtum of a Spheroid, as is directed by ſeveral Authors?

Anſw. Becauſe the difference between F and G is twice as much as between G and A, for if the Arch A H be extended, it will reach to K, but if the Arch H I be extended it will reach to L, which ſhews that the difference between L and F is twice as much as that between K G, ſo conſequently you muſt take two Circles at the Bung, to one at the

Head to reduce it to a Cylinder, but the exacteſt way to reduce it and find a Mean is, to take the Diameter at every Inch, and divide the Sum by the number of Inches between Head and Bung, and the Quotient will be very nigh the mean Diameter, but the beſt Artiſt can never reduce it to a Cylinder.

Queſt. Why do you make uſe of 1077 for a Diviſor in ſuch a Caſe to find the Content?

Anſw. It may be eaſily anſwered, *Becauſe it is triple the Square of the Gauge-point*, but was I to receive ſuch an Anſwer I ſhould not take it as a ſufficient Reſolution, but ſhould demand why it is uſed in ſuch a Caſe, tho' it is the triple Square thereof.

Now the double Square of the Bung Diameter and the Square of the Head Diameter being added together, makes the Sum of the Square of three Circles, therefore you are to divide the Sum of theſe three Squares by thrice the Square of the Gauge-point, for if you was to divide that Sum by 359, being the proper Diviſor for the Square of one Circle, it would Quote thrice as much as the Cask holds.

As for Example. We ſhall ſuppoſe a Cask in form before mentioned to have ſuch Dimenſions as follows, *viz.*

Length	42	Double Square of the	
Bung	36.3	Bung and the Square	3626.63
Head	31.5	of the Head is	

Divide this Sum by 1077, and it quotes ſuch a Number as when multiplied by the Caſks length is equal to the Content of the Caſk, whereas if you divide by 359, it will produce three times the Content.

1077)3626.63(3.367
3956
7253
7910
371

This Quotient multiplied by the Caſks length produces 141.414 Gallons, which is the true Content of the Caſk in Ale Gallons.

Now I ſhall divide the ſame Number, *viz.* the Sum of double the Square of the Bung Diameter, and the ſingle Square of the Head Diameter, by 359, and it will bring forth a Number which will be equal to thrice the Content of the Caſk.

Example.

359) 3626.63 (10.102
366 42
730 20204
12 40408

424.284

The foregoing Work is clear enough to the Intelligible why 1077 is a proper Diviſor, and if that Reaſon be duly conſidered it will be of great uſe in Gauging Veſſels of other forms.

Since there is no Proportion found between a Square and a Circle, I can't ſee any Reaſon why we ſhould take it for granted, that the Square of the mean Diameter, divided by 359, ſhould produce the Area, and why we may not uſe 282 as a Diviſor for Circles as well as for Squares, when the beſt Authors allow that the Area of a Circle is found by multiplying half the Diameter by half the Circumference.

Now if you have a Cask whoſe Diameter is 80, its Circumference muſt be 251.20, the half of theſe two being multiplied into each other, and divided by 282, will produce 17.8 Gallons, for by the Rule of Proportion, as 1 is to the Product of the half of the Diameter, and half of the Circumference, multiplied into each other, ſo is 282 to the Area of the Cask in Ale Gallons.

Example.

1 : 5024 : 282 (17.8

I am of Opinion there may be a more exact way found to meaſure curved Lines than any now uſed, if the Angle of Contact can be found commenſurable, for then it might be eaſie to find a ſtraight Line equal to a curved Line, and by conſequence a

Square equal to a Circle, but the Angle of Contact being (as *Clavius* ſays) a Quantity greater than no Quantity, and the leaſt of all Quantities, there may be an allowance made for it, according to the length of the Cask. More of this another time.

I ſhall conclude this ſmall Work, hoping that whoever peruſes it, and after Conſideration ſhall alledge it erroneous, he will be ſo generous, as not to ſay, *It is falſe, becauſe it is ſo*, uſing the Womans Reaſon, but demonſtratively prove it ſo by Geometry, and after a reaſonable Confutation, I ſhall not only own my ſelf obliged to him, but for the future ſhall pray his Approbation to whatever I do in that nature. *So Farewel.*

FINIS.

29 JA 62